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DISASTER AND RECOVERY

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To Maria, Elias and Einar

O
non sens
non sentiens non
dissentiens
indesinenter
terque quaterque
pluries
vox
vel abracadabra

Abraxas abrasax
Sats motsats slutsats som blir sats igen
Meningslöst
Overkligt. Meningslöst.

Och spindlarna spinner i tysta natten sitt nät
Och syrsorna filar

Om hösten

Gunnar Ekelöf

ABSTRACT

Background: Most people who survive a disaster respond with psychological reactions, but only a minority suffer from lasting psychological problems. Despite evidence of the significance of specific exposures for impaired psychological health after disaster, the relative importance of single exposures remains unclarified. With regard to predisaster factors, the relevance of prior life events is not definite. As for postdisaster factors that influence health, this study of tourist survivors of the Indian Ocean tsunami of 2004 brought about a unique opportunity for studying a population which was spared most of the secondary disruption otherwise common to natural disasters. It also enabled the investigation of the impact of disaster experience on other groups than the most extremely exposed, and the highlighting of the issue of recovery, with special emphasis on intervention in the form of support. Disaster research is still evolving concerning which survivors should be candidates for intervention, and also on how to determine forms of intervention that may be beneficial. It is clear that support, particularly in the form of perception of available support, is important for psychological outcome following disaster. However, many questions remain concerning formalised support, and the role of supportive intervention.

Aim: To investigate the impact of a disaster on the psychological health of survivors of the 2004 Indian ocean tsunami, with special consideration of types of exposure, risk factors, and the role of social support for recovery.

Methods: The study is based on a questionnaire collected 14 months after the disaster from 1 505 citizens of Stockholm who were in the disaster area. Different disaster exposures were categorised and controlled for in all analyses along with sociodemographic variables. In addition, in Study IV, a population survey of Stockholm was used for comparison, and participants were matched on 8 variables. Main outcomes in all four studies were psychological distress and posttraumatic stress according to validated instruments. Suicidal ideation (Study II) and sick leave (Study IV) were also used as outcomes. Logistic regression analyses were used.

Results: The experience of multiple disaster exposures was associated with increased likelihood for reporting of psychological symptoms on all outcomes. Specifically, in Study I, survivors that had experienced life threat were more likely to report above cut off on both outcomes. Study II showed that despite the powerful effect of the disaster experience, life events during childhood and adolescence did have an impact on psychological symptoms. In Study III, support was categorised in indices comprising social support or various sources of formalised support. Satisfaction with all received support within an index predicted an increased likelihood of a better psychological outcome, whereas dissatisfaction with at least one support source constituted a risk for psychological symptoms. Associations were found for formalised support, as well as social support. Study IV showed that participants who had experienced only one or two of the stated types of exposures were more likely to report psychological distress, but not sick leave, compared to the population sample. The least exposed group was less likely to report sick leave than the population sample.

Conclusion:

Provided the absence of secondary disruptions, survivors of a natural disaster can be expected to recover well, with the exception of the multiply exposed. Survivors who report the experience of life threat should be considered for outreach programmes. When survivors are questioned, assessment of symptoms and dysfunction should be supplemented with evaluation of performance. Also, investigating survivors' opinions of support should be standard after disasters. Individuals dissatisfied with support should be approached and offered alternative support from other sources or in other formats.

Keywords: Natural disaster, tsunami, mental health, psychological distress, posttraumatic stress, life threat, life change events, social support, crisis intervention, recovery.

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LIST OF PUBLICATIONS

This thesis is based on the following original articles, which will be referred to in the text by their Roman numbers.

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- II. **Lars Wahlström**, Hans Michélsen, Abbe Schulman, and Magnus Backheden. Childhood life events and psychological symptoms in adult survivors of the 2004 tsunami. *Nordic Journal of Psychiatry*, published online ahead of print April 2010.
- III. **Lars Wahlström**, Hans Michélsen, Abbe Schulman, and Magnus Backheden. Social support, intervention and psychological health among tourist survivors of the 2004 tsunami. *Submitted*.
- IV. **Lars Wahlström**, Hans Michélsen, Abbe Schulman, and Magnus Backheden. Psychological distress and sick leave in Swedish survivors of the 2004 tsunami. *Journal of Nervous and Mental Disorder* 2009; 197: 918-922.

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LIST OF ABBREVIATIONS

CSS	Crisis Support Scale
DSM-IV	Diagnostic and Statistical Manual of Mental Disorders, 4th Edition
DSM	Diagnostic and Statistical Manual of Mental Disorders
GHQ	General Health Questionnaire
IES	Impact of Events Scale
IES-R	Impact of Events Scale - Revised
OR	Odds Ratio
PTSD	Posttraumatic Stress Disorder
WHO	World Health Organization

1 INTRODUCTION

1.1 *What is a disaster?*

The Swedish word *katastrof* has three different English translations; disaster, catastrophe, and calamity. Whereas catastrophe originates from Greek and is associated with tragic drama, disaster stems from Latin *dis astro*, and implies an unfavourable position of the planets (stars), thus linking it to fate. Disaster is by far the most frequently used term, although there is a tendency to use the term catastrophe to connote the overwhelming aspect of disaster (188).

In mental health research, disaster is rarely defined. The Oxford definition is “sudden or great misfortune, calamity; complete failure”. In a recently published book on research methodology, disaster was defined as “a potentially traumatic event that is collectively experienced, has an acute onset, and is time-delimited; disasters may be attributed to natural, technological, or human causes” (144 p.4). A definition that brings the term closer to the consequences of the event is used by Health Care of Stockholm County Council: “A situation where available resources are insufficient in relation to the immediate needs, and where demands are so high that ordinary quality requirements cannot be upheld despite reinforcements and relocation of resources” (190). This is closely aligned with WHO’s definition: “A disaster is a severe psychological and psychosocial disruption, that largely exceeds the ability to cope of the affected community” (246).

1.2 *Types of disaster*

For the purpose of studying the mental health consequences of disasters, it is useful to categorize disasters in different ways (160, 164). The most straightforward typology is to distinguish disasters by cause. For instance, disasters may be the result of natural occurrences such as storms or earth-quakes, or precipitated by human factors, as is the case with technological disasters. However, there is an overlap between different types of disasters, and according to recent overviews (160), the differences regarding health outcomes are insubstantial, with the exceptions noted below. The consequences of natural disasters are highly dependent on human and societal factors, and events such as technological disasters can often be contributed to the unpredictability of nature. Human-caused disasters can either be caused by error, or by intention, as in the case of terrorism or arson. In some respects, the

cause of the disaster does have consequences for the psychological effects on survivors. Technological disasters more often effect long-standing disputes or litigation concerning the issue of responsibility, as the Estonia ferry disaster of 1994 shows (219). Disasters involving mass violence do seem to have more serious psychological consequences than other types of disasters, since intentional harm is especially difficult to comprehend and come to terms with.

War is a deliberate kind of disaster and has profound health consequences. Studies of war veterans, i.e. soldiers, have been particularly important for the traumatic stress literature. However, the consequences that war has on civilians are generally not included in mainstream disaster research literature, possibly because of the different methods through which interventions and aid are provided. In this thesis, literature dealing with the psychological consequences of war is only touched upon when necessary for a specific issue.

The typology described above is less useful when the aim of research is to expand knowledge on the consequences disasters can have for mental health. In this case typologies of other kinds may be more fruitful.

Depending on the people who are affected, catastrophic events are either *centripetal* or *centrifugal* (144). This distinction has consequences for research, as well as for intervention and mental health. Centripetal refers to disasters that strike a specific community of people, e.g. a forest fire. In these cases the exposure is more often geographically defined, the disaster is more likely to have a warning phase, and it may be possible to arrange preventive measures. In contrast, centrifugal disasters imply that the victims are congregated temporarily, such as a travel accident. In this case the responsibility of providing help and support to victims will be spread over many communities, which can have both positive and negative consequences on health in the long term.

The tsunami of December 2004 was both centrifugal and centripetal in character. For the people living around the Indian Ocean it was, like most natural disasters, centripetal. However, from the point of view of this study, it had much more in common with centrifugal disasters, and theoretically the study has therefore drawn more on disaster research of the latter sort.

1.3 Temporal aspects

The speed at which a disaster strikes is essential, since the impact is highly dependent on the degree to which warning systems and protection strategies are implemented. Centrifugal disasters, typically travel accidents, are more troublesome in this respect since they often come without warning signs. Disasters primarily affecting an extent population can often be foreseen, as exemplified by hurricanes or even earthquakes. The duration of the crisis also varies. In most disasters safety and order is quickly restored, but some disasters impose threats that may disrupt the affected community for generations, like the Bhopal toxic disaster in 1984 (155), or the Chernobyl nuclear plant disaster in 1986 (87, 88, 248).

1.4 Societal aspects

The consequences any particular disaster has on the health of an affected population is highly dependent on the level of organisation of society. In poor or non-technological societies preventive measures are not used, and efforts to inform and educate about certain hazards have not been developed. The contrast is illuminated in the difference between two earthquakes with the same magnitude on the Richter scale - one in Armenia in 1988 (13), and one in San Francisco (139) the following year. Both regions are situated on seismic areas. It has been estimated that at least 25 000 people died in the earthquake in Armenia as a consequence of inadequate building constructions and a poor warning system. In the San Francisco earthquake 63 persons lost their lives.

The type of society also has great consequences for the availability of help and support for victims. When disaster strikes secluded authoritarian societies, international organisations have only limited ability to administer aid and mitigate consequences. This can be exemplified with the Burmese people who were heavily hit by the tsunami in 2004 and cyclones in 2008 (260).

1.5 Mental health consequences

Ironically, one of the first large disasters that was studied from a psychological health perspective was a tsunami. The Swiss psychiatrist Edouard Stierlin described long-term posttraumatic symptoms after the devastating earth-quake and tsunami that struck Messina in

Sicily on December 28th 1908 in which 70 000 inhabitants died (230, 237). Stierlin was the first to study non-clinical populations. With a study of 135 survivors he described a number of reactions such as sleep disturbances and nightmares, and emphasized the etiological role of fright for posttraumatic symptoms.

To a large extent the knowledge of psychological health consequences of disasters relies on the broader field of traumatic stress (5, 68, 213, 229, 251). Ever since Stierlin's time, there have been numerous studies of disasters, but only in recent years have more specific reviews and books tried to summarize the existing knowledge and state of the art concerning psychological health following disasters (49, 73, 134, 160, 166, 195). Until recently the field has concentrated heavily on the most conspicuous psychopathological outcome of trauma, posttraumatic stress disorder (PTSD). Other psychiatric disorders are common as well, particularly depression and general anxiety disorder. Problems with physical health and/or somatization are frequent after disaster, even in the absence of physical injury (165, 202, 255).

In addition, disasters bring about changes and transformations in the lives of those affected, which are not directly the objective of psychiatry. Bereavement poses a challenge for many. Irritability and outbursts of anger may influence relations.

The scale of destruction has profound consequences on a collective level. If destruction is extensive, society's ability to intervene and mitigate effects is severely limited (1, 195). Also, the connections and social networks of affected people are disrupted, often meaning that the very people who should be the main sources of support may be gone or have become victims themselves (164). Over time, communities may wither when distrust and hopelessness prevail, or they may prosper when individuals cope with loss and change in creative ways. Cultural and religious factors are particularly important for how trauma and loss are handled (232). There are assumptions that in regions where disasters are more frequent, people are more tolerant of disasters. This is possibly the case in less developed parts of the world (181, 218).

1.6 Risk and resilience factors

After disasters, many people experience strong emotions and disturbances in abilities to function both at work and in loving relationships. However, in the long run, only a minority develop post-traumatic psychopathology. This raises the issue of which factors have the potential to either intensify or inhibit symptoms.

To a large extent, psychological distress after disasters can be traced to the same general risk factors as many psychiatric disorders. Female gender, unfavourable socioeconomic circumstances, ethnic minority status and pre-disaster psychological symptoms are factors that imply increased risk for psychopathology following disaster. Conversely, social support, higher educational achievement and certain personality traits have been linked to decreased risk. For age and marital status, causal pathways are complex and findings are contradictory (160, 165).

Exposure during the event, in particular threat to life, injury, or bereavement has been shown to strongly increase risks for postdisaster psychopathology (160, 165).

Social support is generally considered to have a protective effect following exposure to disasters. Social support refers to the quality and function of social relationships with significant others (47, 224). However, this is a complicated concept, and in disaster contexts it is also dependent on the time perspective one adopts. In any case, a lot of help in the immediate aftermath of disaster may have a protective effect on health (164, 168).

1.7 Recovery

Rather than looking for dysfunction and pathology, it is possible to take the opposite approach. It is only recently that disaster mental health researchers have paid more attention to the observation that most people actually endure horrifying experiences without falling prey to psychological problems in the long run (209). Lately, the mental health of populations after disasters has been described as trajectories of recovery (172, 185). After disasters, almost all of those severely affected do show signs of psychological distress to varying degrees. The few individuals who do not respond with significant distress have been termed *resistant* (171). For these persons, functioning is not significantly altered by the

disaster. For many however, the disaster triggers a period of psychological turmoil. For the group with reactions that at some point reach a level of psychopathology but where the reaction eventually subsides, the term *recovery* is used. For those whose reactions never reach a psychopathological level the term is used. Still others may suffer from persisting symptoms and dysfunction. A course of delayed symptom development and dysfunction has also been described.

1.8 The potential for secondary intervention

An intensely discussed subject is whether psychological problems following disasters could be prevented through intervention (23, 50, 121, 133, 142, 169, 198, 215, 235, 244). The answer at first sight might seem self-evident. It would seem almost inconceivable that society or health-care organisations *not* intervene, when faced with destruction or human suffering on a mass-scale. Not intervening could also have very negative consequences for society. Recently there has been much emphasis on the intrinsic value for both individuals *and* society when it comes to generating hope and feeling of connected after a disaster (96). On an individual level, the issue is more complicated. The question is how to identify those who will not recover so easily, and who might benefit from help (244). Initial high levels of post-traumatic symptoms may be a warning sign, although the level and quality of symptoms in the first few weeks after a disaster have not proved to be reliable indicators for later psychological problems (34, 40, 133, 179, 205, 211). Initially, the majority of affected people will exhibit signs of psychological distress but will recover on their own with support and help from family, friends and co-workers. However, in a situation of mass casualties, the aforementioned epidemiological risk-factors are of little help. Considerable caution has also been expressed against standardised interventions such as Psychological First Aid (23). Recent recommendations emphasise the identification of factors other than symptoms, such as resource loss, when considering which survivors should be offered intervention or formal support (23, 60, 158). Hence, the interest in this thesis for the issue of social support after disaster.

1.9 The tsunami and Stockholm

Sweden has been largely spared from disasters and wars. However, an increasingly technological society and accelerating globalization imply increased risks. Examples of

disastrous events that have struck the Stockholm region in the last decades include the Gottröra plane crash in 1991 (220) where miraculously no one was killed, and the sinking of the Estonia ferry in 1994, in which more than 800 people died (219). The tsunami in the Indian Ocean the 26th of December 2004 had an impact of the same magnitude on Stockholm, with 205 people from this city being lost (148). As a result of modern technology and the affluence of society, Thailand was in 2004 one of the most visited countries by Swedish tourists. Many of these tourists, families for the most part, specifically sought out the wonderful beaches on the coasts and islands of the Phuket and Krabi regions. That was exactly where the tidal waves swept in on the morning of Boxing Day 2004. The contrast between the experience of paradise and the following chaos could not have been more poignant.

From a research point of view, the Swedish group of survivors was unique. It was a non-clinical population with a high pre-event level of social functioning, which was hit by a natural disaster, but nonetheless exposed to secondary stressors only to a marginal extent. Also, the group was not sampled but collected from more or less comprehensive police registration lists of repatriated travellers. These circumstances gave the opportunity to specifically study the effects of disaster exposure on psychological health. In addition, the exclusive focus on the group of survivors from Stockholm County created fortunate conditions for examining the importance of support for recovery. This thesis also comprises a comparison of the group with the population of Stockholm, and, as an example of the importance of pre-disaster factors for subsequent health, a study of the role of life events during childhood and adolescence.

The psychological impact of the Indian Ocean tsunami on the 26th of December 2004 has been studied by others. There are some, albeit too few, investigations of the extant populations around the Indian Ocean (e.g. 98, 216, 225, 232). Studies of survivors from Western countries are accumulating (6, 57, 58, 91, 93, 103, 106-108, 123, 126, 131, 199, 200, 236, 245, 253, 257).

2 THE AIMS OF THE STUDY

The main aim of the present study was to investigate the impact of a disaster on the psychological health of survivors, with special consideration of exposure, risk factors, and the role of social support for recovery.

2.1 *Specific aims:*

Study I

To investigate whether different types of potentially traumatic exposure during the tsunami were associated with subsequent psychological distress or posttraumatic stress.

Study II

To elucidate whether the experience of negative life events in childhood and adolescence, and different types of exposure to a disaster, were associated with psychological distress and post-traumatic stress in a group of tsunami survivors.

Study III

To investigate the association between, on one hand, satisfaction and dissatisfaction with social support and specific forms of formalised support, and on the other hand, psychological distress and posttraumatic stress in a group of survivors with different types of exposure to the tsunami. A second aim was to investigate the association between perceived support and actual received social support according to the CSS, as well as psychological distress and posttraumatic stress in this group of survivors.

Study IV

To compare the levels of psychological distress in a group of survivors who experienced different types of exposure during the tsunami with a matched sample from a population from the same region. A second aim was to study whether certain types of exposure were associated with the extent of survivors' sick-leave.

3 THEORETICAL FRAMEWORK AND PRIOR RESEARCH

The theoretical framework used in this study is to a great extent derived from the knowledge fields of *traumatic stress* (68, 100, 229, 251) and *crisis theory* (78, 254). Fundamentally, traumatic stress is based on a paradigm of the experience of an event that constitutes a psychological trauma (35, 41). Although the diagnostic category of PTSD has been under theoretical debate ever since its officialization in 1980 (68), the etiological model is generally agreed upon today, at least in its initial biological stages. As a result of the encounter with an extreme external stressor (potential trauma), most people respond with immediate reactions comprised of physiological, psychological and behavioural components (205, 206). This complex response is biologically determined and focused in the central and autonomic nervous systems. In essence, this serves to promote the survival of the individual and its kin, and to reduce harm (233). For the affected individual, parts of the nervous system that are involved in learning and memory are activated, and memory traces of the stressful events are left. Under favourable circumstances, the stress activation winds down, as threat no longer is present. In other cases, a de-activation is not allowed, and the continuous psychophysiological arousal, together with the consolidation of traumatic memories, forms the basis for symptoms that constitute PTSD. According to the current state of research, this corresponds to a long-term dysregulation of neurobiological systems (233), and to cognitive, emotional and behavioural alterations (68). Whether posttraumatic symptoms persist or not is partially associated with individual genetic differences (175).

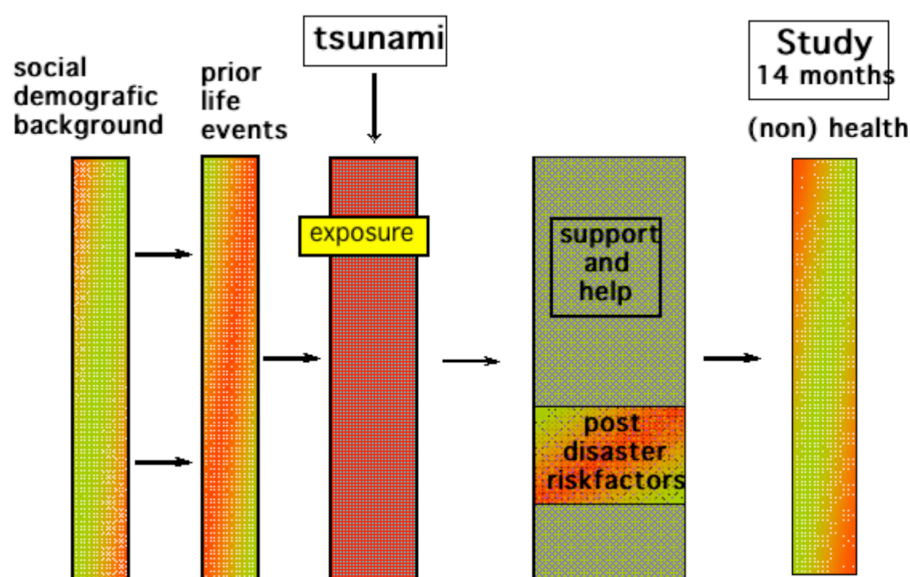
For many survivors, extreme experiences may lead to other health problems and not to full-blown PTSD. However, severe stress not qualifying for a later diagnosis of PTSD, but which still is part of a disaster experience, may precipitate other forms of distress or dysfunction, especially when such stressors are recurrent or long-standing (254). This severe stress includes various losses, uncertainties, challenges and demands (172). The theoretical basis for the latter sort of processes is *crisis theory*, which, in contrast to traumatic stress, has its roots in the homeostatic model of stress theory (127, 207).

The theoretical frameworks of crisis theory and traumatic stress complement each other, and may not be so far-removed as may be construed from how they have evolved. Crisis theory is essential when considering how and when individuals affected by potential trauma should be approached. Whether or not an extreme stressor must exist for the development of chronic posttraumatic symptoms is currently under intensive debate (20, 35, 138, 147, 151, 196).

When considering individuals' vulnerability, i.e. the variability in their capacity to endure stress, the occurrence of posttraumatic syndromes in individuals even after events of lower intensity may be conceivable (21, 35).

In recent years a particular field of mental health research has emerged, which aims to provide a holistic perspective of the many dimensions of disaster consequences experienced on individual, group, community, and societal levels (e.g. 134, 160, 161, 166, 195). The present work benefits especially from this literature.

Figure 1. *Temporal framework of the study.*



The overall theoretical framework for this study is illustrated in Figure1.

The perspective is on the individual and the individual's health.

When a potentially traumatic event strikes an individual, a number of factors come into play - both risk factors and preventative factors inherent in the nature of the event, as well as in the individual's personal and social circumstances - which may indicate a favourable or non-favourable outcome following the experience. At the time of any potentially traumatic event,

the affected person has a specific life situation (living circumstances, family situation, social network, employment, financial situation), possesses a number of characteristics (gender/sex, age, educational achievement, cultural and religious affinities), remembers experiences of prior life events, and may possibly have prior or current psychological or psychiatric problems, all of which will influence the course of psychological health after the disaster.

The disaster experience itself comprises factors (exposure to life threat, adversity, loss, injury and response with horror or panic) which influence the subsequent psychological process, through a direct effect.

Soon after the immediate impact of the disaster, and for some time afterwards, the individual will be approached, or not approached, by other people, fellow survivors, family and friends or professionals and volunteers, and this will decisively influence the process of recovery or pathology.

Following the direct disaster experience, individuals will, to various degrees and at various points in time, be “exposed” to secondary stressors such as displacement, work loss, demanding treatments and adaptations, or resource losses of different kinds, all of which pose a strain to psychological health.

3.1 Temporal sequence of disaster response

An individual’s response to exposure to a catastrophic event follows a trajectory in time, as do the needs of the individual. One way to conceptualise this is to structure the responses in different stages, according to the individual’s particular context. Here I follow Shalev’s staging of responses (208, 212), which aligns to other current formulations (133, 144, 256). At each stage, the individual is challenged by a principal stressor and by central psychological tasks, certain behaviour is especially prominent and has specific concrete goals. Also, at each stage survivors have dominant needs that pose challenges and opportunities for helpers. The different stages are indeed successive, but they overlap to various degrees, and of various duration.

The first stage, the impact phase, is typically short (0-48 hours) but can be longer. At this stage the individual is often confronted with numerous adversities, such as threat to life,

separation, physical injury or novel and incongruous experiences. The predominant psychological task during this phase is survival, and reduction of harm to one-self and significant others. Other psychological tasks include maintenance of contact with other persons, helping others, or the preservation of dignity. Often, certain kinds of behaviours are triggered, such as intensive flight, fight, or surrender or paralysis from fear. In this phase survivors' primary need is protection from adversity in order to obtain a sense of safety, and have basic needs met.

The second stage is the immediate post-impact phase, or rescue phase (typically 0-1 week). In this phase survivors have left the primary stressor behind, and arrived to places of relative safety, like a shelter or hospital or have perhaps been transported to a safe place. In this case, the principal stressor for survivors is the confrontation with a new reality, without having changed psychologically. Hence, the psychological task is to accommodate. Behaviour at this stage is often directed towards safety and predictability, and fellow survivors and helpers can function as psychological "holders" and as sources of information.

The third stage is the recovery phase (typically 1-4 weeks). This is when some survivors involuntarily re-experience what they have gone through, and also feel the need to distance themselves from the experience. Others recall the experiences more voluntarily, with less intensity. The psychological task is now to assimilate and to transform the concrete event into a "mental event". Experiences are re-appraised, a narrative of the event is formed, and processes of grieving commence. Many survivors at this stage appreciate meeting others with similar experiences, and some go through a "honeymoon phase" with strong attachment emotions towards fellow survivors (78). Most survivors do well without external help, but many need support from professional helpers, who should then be available for sensitive interaction and conversation, and be able to anticipate and help the survivor manage further posttraumatic reactions. Helpers must also have the skill to recognise signs of impending psychopathology (158).

The fourth stage implies a "return to life" (typically 2 weeks-2 years). At this point in time, survivors have to come to terms with the incongruence of, on one hand, inner experiences, and on the other hand, external demands and inner resources. For some, clinical disorders will be treated. The psychological task is implementing the psychological changes in the

outer world, implying a re-integration of the individual in social contexts. Many go through changes in relationships or at work, or in the existential domain.

As can be inferred from the above, the time of measurement of psychological outcomes is essential for the quality and quantity of detected effects. For this study, with a time of measurement at 14 months post disaster, most subjects would have theoretically reached the fourth temporal stage of disaster. However, some subjects could be expected to carry traces of stage three.

3.2 *Severity of exposure*

It has been shown in numerous studies that exposure during the impact phase of a disaster is related to psychological outcome (reviewed in 142, 156, 165). Weisæth's study of an explosion in a factory is one such example (238-240). He showed that the development of PTSD was dependent on the distance from the explosion, i.e. the intensity of the stressor. Life threat, injury, bereavement, and also panic during the event has consistently been shown to increase the likelihood of psychological symptoms. Methodologically, several questions have been raised (21, 71, 142, 160) about how to measure disaster exposure and how to rate the severity of exposure. It has been noted on disaster exposure that "researchers often underestimate the complexity of characterizing the experience of individuals" (164 p. 15).

In one group of studies, the number of stressors has been counted as an index of the severity of exposure (e.g. 9, 36, 162). In general, these studies have shown that as the number of stressors increase, participants' symptoms increase. In another group of studies, ordinal measures have been created based on assumptions on the relative importance of different exposures for subsequent symptoms (e.g. 29). With this method, the measures have indeed predicted psychological outcomes.

Another principal issue is the weight of subjective experience versus objective degrees of exposure which pertains especially to the factor threat to life. Earlier studies were not clear on this point (e.g. 137), but lately several studies have supported the importance of perceived, in contrast to actual, exposure, for psychological outcome (56, 146). Objective measures of exposure are easier to establish, such as degree of destruction, severe injury or seeing death (142).

Although there are many inconsistencies in the literature regarding which stressors are more pathogenic than others, injury and threat to life do seem to have more serious consequences for psychological health (136, 170, 226). However, it has been difficult to tease out the impact of any individual factor because they are often interrelated (142). For example, the individual who is injured is likely to experience the situation as life-threatening, and in some circumstances, is also more likely to have his or her relatives nearby, which implies a heightened risk for them being affected as well. Another problem is that in some studies, injury to self is not differentiated from injury to a family member (13).

In addition, different disasters involve different exposures. For example, natural disasters can inflict property and other damage with long-lasting consequences, whereas other disasters generally have short-lived threats. Moreover, even for similar types of disasters, the relative importance of different exposures varies as a consequence of different populations studied. Recently, the point was made by authorities in the field that when assessing exposure “the key elements of exposure must be considered on a disaster-by-disaster basis” (71 p. S23).

In summary, although it is known which risk factors have the most significance as consequences of exposure during a disaster, the relative importance of any single exposure remains to be clarified. This can be of great value when deciding which persons should have follow-up attention after a disaster.

In all studies in this thesis, the established risk exposures life threat, severe injury and bereavement were selected as important variables. In addition, presence on the beach when the waves arrived was considered essential and selected as a specific variable for this disaster. The importance of the severity of exposure for psychological health is the subject of study I.

3.3 Psychological health following disaster

The most commonly studied health consequence of disasters is PTSD (156, 160, 165). The prevalence of PTSD in the first year after a man-made disaster is approximately 25-75% (73). After a natural disaster, it is a much more difficult to explicitly decide which group of persons are direct victims. Therefore, it is not surprising that the prevalence of PTSD after

natural disasters is generally lower, ranging between 4-60% in the first year, although most often towards the lower end of this interval (73, 156).

There is a multitude of self-report instruments for the assessment of psychological trauma and PTSD-symptoms (250). Some instruments were developed during investigations of specific populations, such as the Harvard Trauma Questionnaire for refugees (152), or the Mississippi Scale for Combat-Related PTSD for soldiers (117). However, many different instruments have been applied in disaster studies. In this thesis, posttraumatic stress reactions are measured by the Impact of Event Scale – Revised (241-243) based upon the original IES (101). This instrument is not intended for diagnostic purposes, but merely rates the level of posttraumatic stress reactions. In the presentation of results, a score above the applied cut-off point is referred to as “posttraumatic stress”.

Other psychiatric disorders often co-occur with PTSD. Depression is, according to a meta-review, the second most commonly observed psychiatric problem after disasters (160). Several studies, including postdisaster studies (31, 70, 173), suggest that depression is seldom an outcome independent of PTSD. Accident survivors with both PTSD and depression are more distressed, have lower levels of functioning, and are less likely to recover, than survivors having only depression or PTSD (210). Generalised anxiety disorder is also often identified, whereas phobias, panic disorder and death anxiety have been assessed and observed only occasionally after disasters (165).

Other mental health problems following disasters are part of non-specific distress. These have less often been the focus of studies, but in public health contexts they are just as important (61). These outcomes include a post disaster increase in consumption of pharmaceuticals, nicotine, alcohol and street drugs (245), as well as elevated levels of anxiety, depression and somatic symptom reporting, without reaching levels of diagnostic significance (143, 161, 173). Sleeping problems are extremely common, solely or as part of a somatic or psychiatric malady (160, 124).

Over time, psychopathology rates decline slowly (172, 185), and continue to change for several years. The same holds true for non-specific distress.

Since losses and bereavement are integral parts of disaster, grief is a common consequence. *Grief* is a normal, natural reaction to loss. In the case of disasters, this often takes the form of

complicated grief, since the loss is sudden, unexpected and untimely 187). Complicated grief is therefore more common after disasters (107, 125, 126, 181, 187).

In this thesis, general psychological distress is measured by the General Health Questionnaire, 12 item version (49, 80). The outcome is based on the applied cut-off point (Studies I, II and III), or used as an ordinal measure (Study IV), and is referred to as “psychological distress”.

As noted above, psychological *symptoms* following disaster have been well researched. There is less knowledge about the impact of disaster experiences on the affected people’s ability to *function*. The DSM definition of PTSD was expanded in the 4th edition of DSM to include impairment of function in social, occupational or other important areas, which means that any diagnosis of PTSD should now include this. However, few disaster studies have explicitly focused on this aspect (126, 170, 211), and many other studies seem not to take into account the important difference between outcomes measured by questionnaires and diagnosis made by interview. Shalev has pointed this out in reference to a population study of two Jerusalem suburbs during the Intifada (211). According to measurements made by questionnaire, only 22% of subjects with PTSD experienced concurrent dysfunction and impairment. Sometimes, changes in function have been conceptualised as mediators between exposure and psychological outcomes, rather than the latter. Some investigators have studied this issue from other angles, under the concepts of loss of psychological or social resources, or coping self-efficacy (e.g. 22, 115, 168).

In this work, in Study IV, sick leave was used as a proxy for psychosocial functioning.

3.4 Background factors as risk and resilience factors

With few exceptions (e.g. 221, 223), in published disaster studies, *women* have been shown to have a heightened risk for psychopathology compared to men (160, 165, 227). The differences in risk for PTSD after disaster begin in adolescence and perhaps even earlier, are largest in mid-life, and disappear in late life (159). Compared to men, women’s risk for developing PTSD, independently of trauma type, has tended to land at about 2:1 in various studies (31, 67, 175, 227). The gender factor is moderated by a number of other factors, for

example, in some very traditional cultural contexts the effects of gender may be stronger (159, 162). Evidence is accumulating that the gender difference is founded in both biological factors, which reflect differences in neurobiological stress-response pathways, as well as social and cultural factors, which results in differences in exposure, vulnerability and impact of disasters (120, 177, 188, 189, 193).

The effects of *age* are complex. For a long time it has been assumed that older people are at greater risk for morbidity after disasters. However, in recent years, reviewers of the literature have pointed to the fact that it is in fact middle-aged people who are often the most affected in Western samples (142, 160, 165), and that older people seem to be relatively resilient (15, 61). A possible explanation for these differences may be the middle-aged people's greater burden of responsibility for dependents. It is still an open question how much these contrasts are effects of sampling and research methodology. Comparisons of studies across cultures have shown that age has varied influence in different cultural contexts, which probably reflects life-cycle differences in different populations (163).

Children and adolescents are generally considered to be more severely affected by disaster than adults, although there is little research on pre-school children (160, 165). Children's' distress is also highly dependent on the level of distress of their parents (217). There is a great lack of research on the impact of childhood disaster exposure on adult psychological health, but this seems to be more subtle than previously assumed (145).

Socioeconomic factors influence resilience and recovery from symptoms. Few studies have focused specifically on these factors, but in cases where they are registered, low levels of income, education, and literacy are most often risk factors for psychopathology (160, 165).

Ethnicity is often related to socioeconomic factors and the effects of ethnicity are therefore difficult to isolate (83). In disaster studies from the US, increased risks for psychopathology have been observed in some ethnic minority groups (115, 163).

Genetic factors contribute to the development of PTSD, the most studied outcome of severe disaster exposure, but to date little is known about the role of specific genes (119, 175). The genetic influence on PTSD is to a great extent shared with other psychiatric disorders.

Predisaster psychological symptoms have in most studies been the strongest predictor for symptoms after disaster (160, 173, 214). However, relatively few studies have taken into account pre-existing levels of psychopathology in the general population (142). This is

important, since at a given point in time a significant minority will be suffering from psychological symptoms and psychiatric disorders. Hence, the high predictive value of prior psychological symptoms should come as no surprise. In studies where pre-disaster mental health has been measured, the effects of disaster on psychological outcomes tend to be weaker (97, 165, 197). To further elucidate this, a few studies have attempted to compare the effects of disaster in one afflicted community with an unafflicted community similar to the first one (97, 204, 214). Results have then generally shown elevated rates of psychiatric morbidity, but not always of general distress (204, 214).

The secondary effects of a disaster have important consequences for later outcomes (69, 160, 170). When a disaster inflicts vast material destruction with property damage, resulting in relocation and financial loss, survivors' primary connections become disrupted (164, 168, 258). The chances for supportive interactions are then diminished, which is deleterious. In addition, the more vulnerable a population is from a socioeconomic point of view, the worse and more durable are the psychological consequences of the external destruction caused by the disaster (69, 139).

3.5 Life events

A possible pre-event risk factor for psychological distress after disaster is prior experience of *negative life events*.

In general, the experience of life events as predisposing for psychological problems has been studied for a long time, and associations have been established for a number of psychiatric diagnoses (62, 118, 140, 192), most noteworthy depression (99). The association is especially strong for events experienced during childhood. In particular, sexual or physical abuse during childhood, as well as loss, have been associated with depression (46), drug and alcohol abuse (55, 150), suicide attempts (54) and anxiety disorders (129), including PTSD (118). Traumatic stress in childhood is detrimental for developing neural networks and neuroendocrine systems, which can result in permanent brain dysfunction (89, 11). However, the effect sizes of childhood trauma on psychological problems or adjustment during adulthood are small according to meta-analyses (34, 194).

Research has also shown that prior negative life events increase the risk for psychopathology after several types of subsequent trauma (16, 30, 222). These results have also been

replicated in a general population, where the adult trauma was randomly selected (32). The prevalences of a number of psychiatric disorders increase with the number of potentially traumatic events encountered (32, 140). When it comes to the influence of negative life events on later problems that develop specifically after a disaster, there are to date only a few studies that have shown the risk for psychopathology to be increased with the number of potentially traumatic events experienced (27, 28, 63).

There are many unclarified questions in the field of life events and psychological disorders. For example, it may be that it is not the experience of negative events per se that is important for later distress, but the symptomatic response at the time of the event, which increases the risk for later psychological problems (38).

The importance of prior life events during childhood and adolescence for psychological health after disaster is the subject of Study II.

3.6 Social support and formalised support

The concept of social support refers to the quality and function of social relationships with others in an individual's social network (47, 224). In this work *social support* is used when referring to support from family, friends, co-workers and neighbours. In contrast, *formalised support* is used for professional sources of support and support groups.

It has long been acknowledged that social support plays a key role in determining the extent to which survivors recover or continue to be plagued by symptoms after disaster. There is extensive research on the importance of social support in counteracting stress (224), and in meta-analyses of trauma studies, social support has been found to have a powerful protective effect against PTSD (34, 179). It is reasonable to assume that the protective effects social support has against symptoms is stronger over time, as opposed to the first stages of response to potential trauma (12).

Social support has been classified according to type in instrumental or tangible support (assisting with a problem, donating goods), informational support (giving advice), or emotional support (reassurance, emphatic listening) (102). Another possible distinction is between provided and received support (37). Yet another approach lies in the difference

between the perceived availability of support and the support actually received (203, 249). The former refers to the anticipation of help in times of need, whereas the latter is retrospective. These two constructs are closely related in some studies, but unrelated in others, depending on the object of study and the wordings of items. Most studies have shown perceived social support to be connected to health, whereas received social support has been positively related to symptomatology (249). Some researchers, e. g. Sarason, have conceptualised perceived social support as a manifestation of a relatively stable personality trait (201).

Joseph et al proposed an etiological model for how social support may influence psychological symptoms after trauma, with a starting point in two ship disasters (85, 109-111). In this model, the perceived support received from significant others has the potential to either lower or exacerbate stress levels, as significant others give their own feedback to the survivor's interpretation of events. For example, if a survivor believes he or she acted inappropriately during an event, by "freezing", and other persons inform the survivor that they would have reacted in the same way under these circumstances; this may make the survivor's behaviour more acceptable in his or her view. Support may also have an impact on the survivor's emotional states and coping strategies (85).

Interaction with others can also be unsupportive. At least in the case of sexual assault victims, negative social interaction seems to have a stronger impact on PTSD symptom development than supportive interaction (85, 249). The same was recently found in a study of youths after an earthquake in Taiwan (252).

Formalised support in this thesis denotes a kind of support provided by agencies that do not normally belong to a person's social network. This is the object of intervention. After major incidents affected persons may receive assistance, help and support from professionals including emergency workers, police, health care staff, social services, support groups, religious communities and insurance agencies.

The inherent qualities of social support (tangible, informational, and emotional support) are also components of formalised support, and a main objective in different models of formalised support is to promote social support after trauma (e.g. 96, 195). However, studies on how the various forms of formalised support impact social support in the context of

trauma or disaster have, to my knowledge, not been published. On the other hand, the issue of intervention after trauma, including disaster, has been intensely debated (133, 178, 195, 235). In the absence of direct research evidence, a consensus document based on evidence-informed empirical literature was recently published (96). The recommendations state that after major incidents, an important goal for intervention is to encourage and promote connections, and to assist survivors in maintaining contact to loved ones. Furthermore, intervention is especially recommended for people lacking strong social support.

In disaster studies it has been difficult to show positive effects of received social support, due to the fact that those receiving the most support tend to be the worst affected (160). In contrast, perceived social support is more clearly related to positive health outcomes after trauma (51, 65, 110, 154, 160).

In the aftermath of disasters there is typically a strong mobilisation of helping behaviour (114), often followed by a deterioration of perceived social support, as demonstrated by Kaniasty and Norris in a series of studies (115, 164, 168). Since disasters often bring about prolonged periods of stress, and various secondary stressors, support networks may be strained and outworn. There may be many reasons for this. The need for support may simply be larger than what is available. The social network may be reduced as a result of relocation or the death. Survivors also often alter their routine social activities following severe events, leading to reduced opportunities for social interaction. Companions may also want to avoid encountering survivors' stories or emotional expressions about the event. The potential for conflicts may also increase with physical fatigue, emotional irritability and scarcity of resources. On the other hand, as Kaniasty and Norris showed, when survivors received a great deal of help in the aftermath of disasters, it produced lasting effects on the perception of social support, which in turn had an protective effect on health (164, 168).

Women and men probably differ in their social functioning after severe events, but this has not been studied in disaster contexts (164). It has been suggested not only that women are disproportionately the providers of social support, but also are more likely to seek social support in response to stress, and that women benefit more than men from social support (224). In some studies, especially of traditional cultural contexts when entire communities have been struck by disaster, women have reported lower levels of perceived social support

than men (164), which has been suggested to be due to their orientation to the domestic space and lack of power and status compared to men (25).

Methods of measuring perceived social support have been extensively discussed (168, 201, 249). Studies of perceived social support in disasters have typically used instruments based on general items, e g the Provisions of Social Relations Scale (228), or the Crisis Support Scale (CSS) (76, 110, 111). There are, to the best of my knowledge, no studies that have linked different sources of formalised support to such general measures of perceived support.

Study III deals with received and perceived social support, and the association of psychological health, following the tsunami.

3.7 Summary

The review of prior research shows that despite evidence of the significance of specific exposures for impaired psychological health after disaster, the relative importance of single exposures remains unclarified by the research.

With regard to predisaster factors of importance, the relevance of prior life events is not definite.

It is clear that support, particularly in the form of perception of available support, is important for psychological outcome following disaster. However, many questions remain concerning formalised support, and the role of supportive intervention.

There is a dearth of studies of the consequences of disasters on the psychosocial functioning of survivors.

4 THE STUDY

4.1 Design

The study is of cross-sectional design. In all four papers, data on tsunami survivors are based on a self-report collected through one questionnaire 14 months post disaster. In addition, in paper IV, data from a population survey collected the same year was used.

4.2 Materials and collection of data

4.2.1 Study group

The study group was part of a larger population. Between the 27th of December 2004 and January 15 2005, nearly all travellers returning from South-East Asia through Swedish Airports were registered with personal identity numbers by police authorities, as part of disaster management. Of Sweden's 21 administrative regions, 10 agreed to perform investigations based on their citizens registered on the police lists. In collaboration with the Uppsala Centre for Disaster Psychiatry, an introductory letter was sent in February 2006 to all eligible persons 16 years and older ($N=10\,501$) registered in one of these counties. One week later this was followed by a questionnaire, including a return envelope with paid postage. A reminder was sent to those not responding four weeks later. In total 4932 persons responded.

This study is based on data from respondents living in Stockholm County at the time of the study. At the airport, 4432 citizens of Stockholm County were registered. 149 actively declined participation, the majority of whom stated that they had not been in the disaster-affected region. The questionnaire was mailed to the remaining 4283 persons registered in Stockholm County. 1939 responses were collected, corresponding to 45% of participants. Nonresponse was significantly more common in younger age groups, χ^2 (4, $N=4276$)=132,29, $p < 0.001$ (seven missing values among respondents), and more common among men (61%) than women (48%), χ^2 (1, $N=4283$)=77,91, $p < 0.001$. Of the 1939 respondents, 434 stated that they had not been in a tsunami affected region. The remaining 1505 individuals constituted the study group in all four papers.

The decision to collect data at 14 months post disaster was only partially a result of deliberate strategy. First, it was a consequence of practicalities, such as organisation of funding, production of the questionnaire, ordering the lists of research subjects, and the application for ethical approval. Secondly, it was decided to delay the mailing of the questionnaire until after the Christmas and New Years Holidays of 2005, so as not to have responses influenced by anniversary reactions (153).

4.2.2 Comparison group in Study IV

Approximately every four years a public health survey is undertaken for the adult (age 18-85) population of Stockholm County, which has approximately 1.9 million inhabitants. The purpose of the survey is to obtain information on trends regarding health conditions, morbidity, mortality and health-related customs in the county of Stockholm. We used 34707 responses on the 2006 health survey, which had a response rate of 61% (10). The collection of population data was conducted by the Unit of Epidemiology in the Department of Community Medicine of Stockholm County Council.

4.3 Outcome variables

The questionnaire used for the study group was developed from a Norwegian original (92), and modified in collaboration with The Centre for Disaster Psychiatry and The Department of Medical Epidemiology and Biostatistics at, Karolinska Institutet (148).

Psychological distress

The General Health Questionnaire (GHQ) is a measurement tool for the detection of psychological distress in community and non-psychiatric settings, and exists in four versions of various lengths (81). The shortest version, comprising 12 items, was chosen due to its wide usage in studies of general populations (80), and it has also been recommended for the assessment of affected individuals after disaster (49). The reliability and validity of the GHQ is very thoroughly tested (247). Although the 12 item version of the scale has been shown to consist of more than one factor, it is recommended to be used as a one-dimensional measure (77).

The GHQ-12 contains questions pertaining to psychological health rated over the past few weeks, with each item scored 0 to 3. The higher the score, the more distressed the respondent. Responses were dichotomized in accordance with the constructors' original instruction (81), whereby ratings of 0 or 1 were coded as "0" and ratings of 2 or 3 as "1," giving a range of 0-12. The Cronbach's alpha for the study group was 0.94.

In Studies I, II and III, the response sums were dichotomized, with scores 0-2 coded as 0 and scores 3-12 coded as 1. The cut-off threshold between 2 and 3 has been used for many non-clinical samples (80, 141). In Study IV the scale was treated as an ordinal variable in order to benefit more of the response distribution, which was skewed to the left (247). Due to an error in item no.7 (*Have you recently been able to enjoy your normal day-to-day activities?*) in the questionnaire used for the population survey, the scale was reduced to 11 items, resulting in a range of 0-11.

Posttraumatic stress

The Impact of Event Scale Revised (IES-R) (243) is composed of 22 items, and was developed from the original Impact of Event Scale (IES) (101), which up until 2004 had been the most widely used self-report instrument for stress response (241). The original IES consisted of 15 items and comprised the subscales intrusion and avoidance. To align the scale to the development of the diagnosis of PTSD, a third subscale tapping hyperarousal symptoms was added. The directions for the respondents were modified from asking about the frequency of symptoms to the degree of distress of symptoms. The scoring was also altered from a stepwise scoring algorithm that produced sums to a Likert scale. The psychometric properties of the IES-R have been presented (19, 52, 241) and its reliability and validity has been shown in a number of translated versions (e.g. 14, 18, 39, 57, 176). The Swedish translation has been used in prior studies (135, 182, 191), but is not formally validated.

The IES-R contains three subscales corresponding to the three dimensions in the diagnostic criteria for PTSD in DSM-IV: intrusion (7 items); avoidance (8 items); and hyperarousal (7 items), giving a range of 0-88. The degree of distress during the last week in response to a specific stressor is rated on a 5-point scale for each item, ranging from 0 = *not at all* to 4 = *extremely*. In this study, the stated stressor was the tsunami. The Cronbach's alpha for the study group was 0.95.

There is no accepted cut-off point for the IES-R (241), since the instrument is not intended to be used for diagnostic purposes. Despite this, cut-off scores are often applied in research (e.g. 14, 52, 126). In this work, the threshold in the analyses was set at the 75th percentile, which meant coding scores 0-32 as 0 and scores 33-88 as 1.

The scale was chosen instead of diagnostic scales since the study population was not a clinical one.

Suicidal ideation (Study II)

Suicidal thoughts were investigated with a question from Paykel (184): *Have you during the last 12 months thought of taking your life, even if you would not really do it?*, with the response alternatives yes or no.

Sick leave(Study IV)

Sick leave or disability leave during the 12 months before answering the questionnaire was used as a proxy for function among respondents who were employed. In order to align the measure of sick leave in the study group with the comparison group, sick leave was dichotomised at more or less than 2 weeks during the last year.

4.4 Explanatory variables

4.4.1 Socio-demographic information

Gender

Female gender was used as reference in the analyses.

Age

Age was categorised into five groups: 16-24, 25-34, 35-44, 45-54, ≥ 55 years.

In Study II the first age category comprised 18-24 years of age, in conformation with the Public Health Survey. The last category was used as reference in the analyses.

Education

The level of educational achievement was categorised into grade school (up to 9 years), high school (12 years), and university or college (>12 years). The last category was used as reference in the analyses.

Living arrangements

Living arrangements were categorised into widowed, single with child(ren), single without child(ren), living with parents, and married or cohabiting. The last category was used as reference in the analyses.

Employment status

Studies I, II and III: full-time work before the tsunami (reference) versus all respondents not working full time before the tsunami.

In Study IV categories had to be adjusted to items in the public health survey. Hence, three categories were used: not working (retirement, unemployment, disability leave, sick leave), working part-time, and working full-time, with the last category used as reference in the analyses.

Children

Company of children (<18 years) on the journey was recorded and used with dichotomisation between those who reported having had the company of children, with those who did not (reference). For the reference group in Study IV, it was registered whether or not there were children in the household.

4.4.2 Severity of exposure

The questionnaire contained four items related to the types of exposure to the disaster, such as whether the respondent was on the beach (including in the water) when the wave hit (item 4.2), and whether the respondent experienced life threat (item 4.11), sustained severe physical injury (item 7.3), or suffered the loss of a significant person (item 2.1). Eight categories, hereafter called *exposure groups*, were created out of the possible combinations of items (Table 1): A. Presence on the beach and experience of life threat, injury and loss. B. Presence on the beach and experience of life threat and loss. C. Presence on the beach and experience of life threat and injury. D. Presence on the beach and experience of life threat. E. Experience of life threat. F. Presence on the beach. G. Experience of loss. H. The last category was constituted of all those who did not affirm any of the four exposure alternatives mentioned above, but it was notable that, in this category as well, many respondents had been exposed to stressful experiences during the disaster. This last category was used as reference in the analyses.

Table 1. *Combinations of exposures in the different exposure groups*

	Number of respondents	Life threat	Presence on beach	Bereavement	Severe injury
A	34				
B	105				
C	42				
D	268				
E	270				
F	199				
G	51				
H	536				

4.4.3 Life events (Study II)

The questionnaire asked about the experience of negative life events before the age of 16, with a checklist resembling the format of The Life Event Checklist (82). Four indices were created from nine different items; the experience of accidents (two items: traffic accident or other accident; natural disaster), violence (two items: severe violence or abuse; war or terrorism), loss (three items: loss of parent, sibling, or other close relative) and interpersonal events (two items: serious conflict with relative; divorce or separation of parents), respectively. Responses were dichotomised, with no experience of any such life event coded as “0”, and any affirmative response within each index coded as “1”. The non-reporting of life events in each index was used as reference in the analyses.

4.4.4 Support (Study III)

Received support

In the questionnaire, respondents were asked whether they had received support (item 10.8, See Table 2) either from private sources which were categorised as *social support* (six sources: accompanying family on the journey, other tsunami survivors, family members not in tsunami area, friends not in tsunami area, neighbours, workmates), resulting in 0-6 alternatives, or from *formalised support* from semi/professional sources, which were categorised in the different indices a) support from somatic health care (hospitalised, disaster

health care centre, primary care), b) psychological care (social worker or psychologist in primary care, child- and adolescent psychiatry or adult psychiatry, private psychotherapist), c) support groups (organised by a hospital, or several non-governmental organisations), and d) support from insurance agencies (Social Insurance, or private insurance companies). For each index, formalised support was coded as “1” for a yes on any alternative in each index, and “0” for none. Formalised support ranged from a single visit to a disaster centre to scheduled visits with a psychotherapist over many months.

Table 2.

Item 10.8: “Have you received help or support from any of the following?”

Item 10.9: “After returning home, what is your evaluation of the help you received?”

Private sources:

Accompanying family on the journey

Other tsunami survivors

Family members not present in the tsunami area

Friends not present in the tsunami area

Neighbours

Co-workers

Semi/professional sources:

Hospital care

Disaster health care centres

General practitioner

Psychological care:

Psychologist/Social worker in Primary Care

Adult psychiatry

Child & adolescent psychiatry

Private psychotherapy

Support groups

Insurance agencies:

Social Insurance

Private insurance companies

Perceived support

Respondents’ opinions of the received support explained above was recorded (item 10.9) and categorized with the following alternatives: very satisfied, satisfied, dissatisfied, and not applicable. For each respondent, satisfaction with support received was created as a fraction of support actually received. For example, with regard to social support, each respondent

could have received 6 different forms of support, and be satisfied with any one of these (0-6), thus giving a fraction of 0 to 6/6. For respondents who had received 5 different private sources of support, the fraction was from 0 to 5/5, et cetera. The variable was dichotomized into the values “1”, and “<1”, respectively, corresponding to “satisfied with received social support”, and “dissatisfied with some received social support”. This variable was then used as an explanatory variable in the statistical analysis. For the analyses containing dissatisfaction with social support, the variable was separated into dissatisfaction with none, one, or multiple forms of support. For the four types of formalised support, dissatisfaction with none, or any, form of support was used as an explanatory variable in separate analyses.

The Crisis Support Scale (CSS) was constructed to measure social support quite soon after potentially traumatising events (111, 112). The instrument’s creators originally proposed that it would measure social support “actually received in a time of need” (109 p. 75). A later validation of the instrument concluded rather that it measured multi-factorial aspects of social support (59), nota bene that the scale in later studies almost exclusively has been used retrospectively (24, 59, 76), and not immediately following the disaster as was originally intended. It also showed the scale to be robust (59). The instrument contains seven items, with seven response alternatives ranging from never to always, with a higher score indicating a higher level of social support. The first six items are *appraisals of current available support*, while the seventh is a comprehensive *appraisal of support received* since the event, also called “satisfaction with support” by the scale’s creators (110). In a confirmatory factor analysis of our data by Varimax and Promax rotation, the scale consisted of two factors, numbers 1-5 and number seven. Item number six (*Did people you expected to be supportive make you feel worse at any time after the disaster?*) loaded on both factors and was analysed separately. Thus the scale was treated as consisting of three indices. A first index comprising items 1-5 resulted in a range of 5-35. The other two indices comprised only one item each with a range of 1-7.

4.5 Statistical analysis

Descriptive statistics were performed in order to form a basis for later analyses. Frequency tabulations and cross tabulations were used together with tabulations ordered specifically for the different exposure groups, separated with respect to gender. T-tests and chi-2-tests were applied. For correlations between main outcome measures, the following non-parametric

methods were applied since distributions were skewed: the Mann-Whitney test for independent samples, and the Wilcoxon matched pair test for dependent samples.

In all four studies, logistic regression analyses were performed to determine odds ratios (OR) with 95% confidence interval (CI). SAS version 9.1.3 software (SAS Institute Inc, Cary, North Carolina) for Windows was used to calculate data.

In Study I, models were created for the prediction of high score on GHQ and IES-R, beginning with all explanatory variables included. The fully adjusted models were optimised, and non-significant factors were not involved in these models. At each step in the variable selection procedure, the predictor that least contributed to the likelihood function was removed from the model (removal criterion: $p > 0.05$). A manual backward elimination procedure was used in the first examination. Later the stability and uniqueness of the model was checked with automatic backward elimination and stepwise selection (removal criterion: $p > 0.05$). The analyses were performed both with and without weighting for age and gender in order to compensate for potential selection bias due to nonresponse. The unweighted analyses produced only minor changes in outcome. In Study I, analyses were also performed with adjustment for family clusters since 28% of respondents had shared addresses. All potential two-way interactions were checked. The explanatory variables were tested for multi-collinearity. The final models were tested for influential observations.

In Study II, models were created for the prediction of high scores on GHQ, IES-R, and suicidal ideation, beginning with all life event indices and also including other explanatory variables. At each step in the variable selection procedure, the predictor that least contributed to the likelihood function was removed from the model (removal criterion: $p > 0.05$). A manual backward elimination procedure was used in the first examination. Later the stability and uniqueness of the model were checked with automatic backward elimination and stepwise selection (removal criterion: $p > 0.05$). Gender and exposure were shown in Study I to be important variables, and were therefore retained in the final models for estimation of effect of life events. All potential two-way interactions were checked. The explanatory variables were tested for multi-collinearity. The final models were tested for influential observations.

In Study III, separate logistic regression analyses, with GHQ and IES-R as outcomes, were conducted with four predictor sets; *reception* of support from social support and from four different types of formalised support, *satisfaction* and *dissatisfaction* with the above-mentioned support, respectively, and *appraisal* of support according to the two factors of CSS. Significant variables among potential risk factors were identified through analyses where all potential variables were included in the first model. All analysed models included the exposure of respondents as an index variable consisting of the eight different categories of exposure.

In Study IV, a matching procedure was performed between respondents in the single exposure groups and the comparison group. Persons born after 1987 were excluded from the study group since the population survey only comprised individuals older than 18 years, leaving 1463 respondents for matching. The matchings were performed in 8 steps where the first matching was based on the following independent variables: gender, age group, educational level, status of living, having children (controls) or company of children on the journey (study group), employment, borough of residence, birth in Sweden, and a response to GHQ-12. The first matching resulted in 1023 respondents and 9936 controls. The remaining matchings were performed with less restriction since one matching variable was excluded for each step. In step two, the variable “employment” was excluded, resulting in an additional 101 respondents and 744 controls. In step three the variable “birth in Sweden” was excluded, resulting in an additional 97 respondents and 1400 controls, totalling 1221 survivors and 12 080 controls. Respondents and controls already matched under more restricted conditions were excluded from further matchings with less restricted conditions, which meant that matched respondents and controls formed a unit, a cluster, in which no controls matched on less restricted conditions were permitted to be included. The 719 clusters varied in size, from one respondent and one control to 26 respondents and 296 controls. Later, only the first three matchings were used due to loss in precision when fewer variables were used as conditions in the matching process. In a later stage the data was divided into subsets according to exposure groups. The controls followed the respondents according to the respondents’ matching clusters. The matching procedure was performed with the programme package R, <http://www.r-project.org/> and the match function MatchIt, version 2.3-1, with exact matching (95). Logistic regression was performed with the matched groups, and this was then repeated with the matching variables acting as controlling variables. The rationale for this was: first, to eliminate possible imbalance that could have emerged through the matching

procedure, and secondly, to control for an existing association between these variables and the outcome variables. The results of the different analyses showed only minor shifts.

In Study IV, GHQ was calculated as an ordinal measure, and logistic regression analyses were thus performed for proportional odds, with the matching cluster as a basic unit. First, an analysis with independent sample was performed in order to identify the independent variables that showed significance. These were then entered in an analysis for dependent sample. The odds for high score on the outcome variable GHQ-12 were modelled in the analyses. Separate analyses were performed for each exposure group. At each step in the variable selection procedure, the predictor that least contributed to the likelihood function was removed from the model (removal criterion: $p > 0.05$). A manual backward elimination procedure was used in the first examination, and later the stability and uniqueness of the model were checked with automatic backward elimination and stepwise selection (removal criterion: $p > 0.05$).

Sick leave was analysed as a dichotomous variable with logistic regression in dependent sample. The fully adjusted models were optimised and non-significant factors were not included in these models. Separate analyses were performed for each exposure group.

4.6 Ethical issues

General considerations

There are certain ethical issues pertaining to the collection of material from disaster survivors. However, literature dealing with this issue is incomplete (48, 64). It has been assumed that survivors are vulnerable and in need of protection from researchers, due to impaired capacity to provide voluntary or uncoerced informed consent to participation (130). The main risk that has been contemplated is that of emotional distress. Evidence has shown that negative emotions are experienced by at least some individuals during post trauma research. However, the issue is complicated. For example, even if individuals may be upset during participation, this does not imply that they regret having participated. The use of the term re-traumatization has been deemed irrelevant in disaster-research contexts (64). Arguments have also been put forward describing the benefits of participating in disaster research (157). Ultimately, it is important to make a risk-benefit analysis before approaching research subjects.

In a review of cost-benefit appraisals submitted by participants in trauma-focused research, it was concluded that most individuals make favourable cost-benefit appraisals. A subset reported strong negative emotions, but the majority of this subset did not regret or negatively evaluate the overall experience of participating (157). This has later been confirmed by an investigation of participant reactions to telephone-surveys after the World Trade Center disaster in New York 2001 (72). A minority were upset by the interview but only 1% (of 5 774 persons) were still upset at the end of the interview, and 0.3% wanted assistance from a counsellor. Some categories of participants were more likely to find the survey emotionally upsetting (people with mental health symptoms, and those who lacked health resources).

The present study

In March 2006 an information letter was sent to adults and youths 16-18 years old. A special information letter was sent to the parents of the youths. 149 individuals declined participation by telephone or mail, explaining in most cases that they had not been in the disaster areas. A week later the questionnaire was sent to the remaining group. A reminder was sent to those not responding four weeks later. The research group decided not to send more than one reminder, arguing that it would be too importunate and could be emotionally upsetting, and thus would be unethical. In retrospect, this seems to have been over-cautious. For example, in more than 100 participant interviews performed by the research group, survivors have unanimously expressed appreciation for the opportunity to respond to the questionnaire, with the expectation that it may benefit future victims.

The study was approved by the regional ethical committees of Uppsala and Stockholm.

5 RESULTS

Response rates to individual questions varied from 92% for men on the questions on received support from other tsunami survivors, neighbours, and general practitioners, to 100% on several questions. On GHQ and IES-R, response rates varied between 95% and 98%. 99% of both men and women responded to the question of suicidal thoughts.

5.1 Characteristics of the study population

The study population consisted of 1505 persons, 638 (42%) men and 865 (58%) women (two persons had missing values on age), between 16-79 years old. The average age was 41.8, with 40.5 for women, and 43.6 for men. The participants were well educated, with 48% having more than 12 years of education, compared to 28% in Stockholm County and 22% in the general Swedish population in 2006 (4). Seventy-one percent of participants were married or cohabiting. The proportion of full-time employment was very high, and the rate of unemployment was only 1% before the tsunami. Thirty-five percent of participants had children with them on the journey, either children of their own, or grandchildren.

5.2 Exposure to the disaster

All participants were in areas affected by the tsunami of the 26th of December 2004. They were to varying degrees exposed to the disaster through severe injury (men 5%/women 5%), presence on the beach or in the water when the waves arrived (35%/40%), or through experiencing the situation as life threatening (40%/49%). Furthermore, it is notable that many in the least exposed group (H) also reported other distressing experiences, such as encounters with victims searching for their loved ones (58%), or abandoned children (22%), or dead bodies or severely injured, although to a lesser degree than the other exposure groups.

One hundred ninety individuals (13%) reported the loss of an important person. In exposure groups A and B, 47% of the 139 participants reported an extended family relationship to the lost person. In comparison, only 14 of the 51 respondents (27%) in exposure group G reported the lost person to be a family member.

5.3 Psychological distress and posttraumatic stress symptoms (Study I)

Individuals belonging to the more severely exposed groups reported the highest levels on GHQ (exposure group A: 74%) and IES-R (exposure group A: 56%). Within all exposure groups, women were more likely than men to report scores above cut-offs for each measure, although these differences were not statistically significant.

Figure 2. Percentages of respondents reporting ≥ 3 on GHQ according to exposure group and gender.

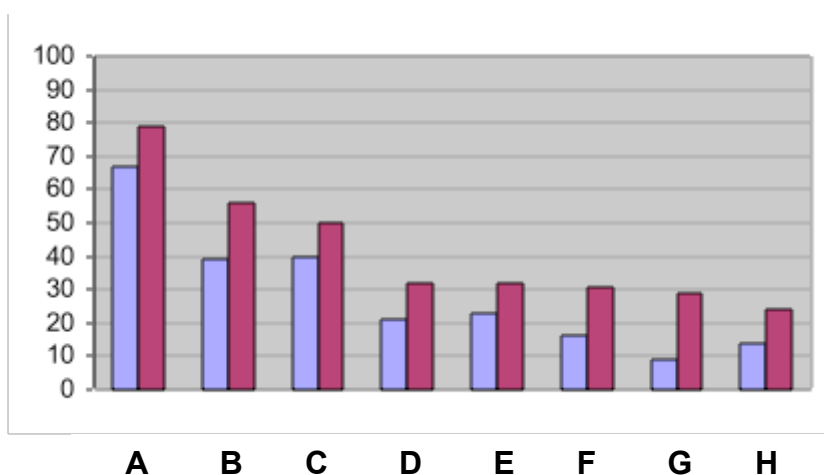
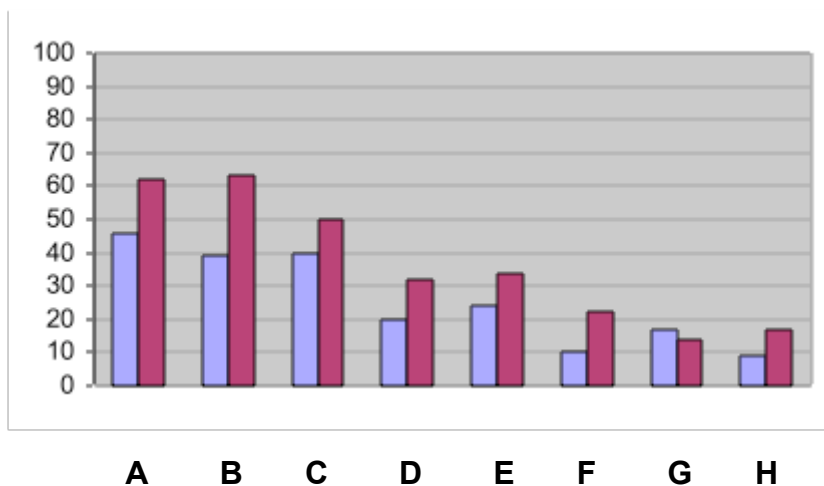


Figure 3. Percentages of respondents reporting ≥ 33 on IES-R according to exposure group and gender.



In the logistic regression analyses with GHQ as outcome, the ORs for the following exposure groups differed from the reference group (H): the groups with multiple exposures (A, B, C; $p<0.001$), the groups reporting life threat and presence on the beach, and the groups reporting life threat only (D and E; $p<0.05$). With IES-R as outcome, results were parallel; groups A, B, C, D and E showed a difference from the reference group H ($p<0.001$) (Table 3 in article 1).

In the multivariate analyses, women showed significantly ($p<0.001$) higher risks for reporting above cut-offs for both outcome measures.

For other covariates, age under 35 years, and single living, were associated with higher scores on GHQ, whereas educational level at maximum 12 years, and single living, were associated with higher scores in IES-R.

In the case of IES-R, a significant ($p<0.05$) two-factor interaction was found between gender and education. Men with 10-12 years of education reported higher scores on IES-R, than either men with a maximum of nine years of school, or men with >12 years of education.

The analyses presented in Study I were weighted for age and gender. Unweighted analyses produced only minor changes in outcomes, and are therefore not presented.

The main findings of study I were the following: first, that those with multiple exposures reported the highest levels of psychological symptoms, and second, that the experience of life threat only, resulted in higher risks for psychological symptoms even 14 months after exposure.

5.4 Life events before age 16 as a risk factor for psychological distress and posttraumatic stress (Study II)

The descriptive statistics showed that 41% of all respondents reported at least one adverse life event before age 16, with numbers individually varying from zero to four. The most frequently reported life event before age 16 was divorce/separation of parents in the index interpersonal event. Six percent of respondents affirmed the experiences of violence or abuse before 16 years of age.

By index, interpersonal events were most commonly reported, followed by accidents. There were no gender differences in the distribution of life event indices in the group as a whole. However, the distribution of life event indices across different exposure groups and gender differed slightly, most notably in the three smallest groups. Correlations between life event indices were in general low, with the highest significant correlation coefficient 0.24 for the indices loss and interpersonal events for women.

In the logistic regression analyses, high scores on GHQ were associated with the indices accidents (OR: 1.7, CI: 1.2-2.4), violence (OR: 2.3, CI: 1.4-3.7) and loss (OR: 1.6, CI: 1.1-2.3). High scores on IES-R were associated with the indices violence (OR: 1.5, CI: 1.1-2.3), loss (OR: 1.8, CI: 1.1-3.1) and interpersonal events (OR: 1.4, CI: 1.0-2.0). Suicidal ideation was associated only with the index interpersonal events (OR: 1.7, CI: 1.1-2.5).

For covariates, results on the outcomes GHQ and IES-R followed the results from Study I. Suicidal ideation was associated with female gender, age up to 44 years, single living or living with parents, and for the two most severely exposed groups.

The main finding of study III was that, despite the powerful effect of the disaster experience, life events during childhood and adolescence did have an impact on psychological symptoms.

5.5 Social and formalised support, and psychological distress and posttraumatic stress (Study III)

Concerning the reception of support, descriptive statistics showed that 89% of women and 78% of men affirmed at least one type of non-formalised support (social support). When it came to sources of formalised support, 32% of women and 28% of men had received support from somatic health care, 27% of women and 18% of men from psychological care, 18% of women and 13% of men from support groups, and 45% of women and 41 % of men from insurance agencies.

Concerning the perception of received support, 82% of women and 85% of men reported satisfaction with all types of received social support. Corresponding figures for somatic health care were 77% for women and 80% for men, for psychological care 76% for women and 83% for men, for support groups 91% for women and 94% of men, and for insurance agencies 86% for both genders.

Also according to CSS, respondents were as a group satisfied with current available support (CSS1-5), with a median total score of 27 for both men and women, . For satisfaction with

received support according to CSS7, the median score was 6 for both genders, and for CSS6 the median was 2 for men and 3 for women.

Reception of social support correlated only with IES-R (Spearman 0.15; $p < 0.0001$). Reception of formalised support correlated with both outcomes for all different types of support, albeit weakly. See Table. The correlations show that individuals reporting scores above threshold on GHQ and IES-R were more likely to have received different types of formalised support.

Table 3. Spearman correlations of the reception of types of formalised support with GHQ and IES-R. All correlations $p < 0.0001$.

	GHQ	IES-R
somatic health care	0.19	0.23
psychological care	0.24	0.28
support groups	0.20	0.23
insurance agencies	0.16	0.21

Concerning dissatisfaction with social support, reported scores increased on both outcomes with the number of sources of social support reported as dissatisfying. Concerning dissatisfaction with the various types of support, there was a correlation between dissatisfaction with social support and GHQ (0.20) and IES-R (0.18) (both $p < 0.001$).

In the logistic regression analyses, high scores on the GHQ were negatively associated with satisfaction with all types of support within the indices social support, psychological care, and insurance agencies, and dissatisfaction with any type of support was used as a reference within each index. High scores on the IES-R were negatively associated with satisfaction with all types of support within the indices social support, somatic health care, and insurance agencies, and dissatisfaction with any type of support was used as a reference within each index (Table 3 in article 4).

In the logistic regression analyses concerning dissatisfaction with support, the ORs for high scores on GHQ and IES-R were 7.8 (CI: 2.8-25.2, $p < 0.001$) and 2.2 (CI: 0.8-6.0, *n.s.*) for dissatisfaction with multiple sources, and 2.4 (CI: 1.4-3.9, $p < 0.001$) and 2.2 (CI: 1.3-3.9, $p < 0.001$), respectively, for dissatisfaction with one source of social support. With regard to

formalised support, analyses of dissatisfaction did not provide any additional information compared with satisfaction, since dis/satisfaction was dichotomised for these support sources.

In all models containing satisfaction and dissatisfaction as explaining variables, some background variables were also important for explaining the odds for symptoms. Following are a few of the most important of these variables. The variable exposure group was significant in all models, and gender in all but one (somatic care in GHQ). The variables educational achievement and company of children were significant for IES-R. Age and living arrangements were significant in both models containing social support, and predicted high scores on GHQ and IES-R.

Concerning results for CSS, *perceived available support* at 14 months post disaster (CSS1-5) was correlated to dissatisfaction with social support ($-0.15, p < 0.001$) and somatic health care ($-0.12, p < 0.05$). Negative response on support (CSS6) was correlated to dissatisfaction with social support ($0.24, p < 0.001$), somatic health care ($0.26, p < 0.001$), psychological care ($0.24, p < 0.001$) and support from insurance agencies ($0.16, p < 0.001$). Levels of *appraisal of the support received* after the disaster (CSS7) were correlated to dissatisfaction with social support ($-0.21, p < 0.001$), somatic health care ($-0.20, p < 0.001$) and psychological care ($-0.14, p < 0.01$). The correlations between the opinion of various types of support and CSS7 were somewhat higher for dissatisfaction than for satisfaction (for example, for social support -0.21 versus 0.15). The correlation between CSS1-5 and CSS7 was $0.58 (p < 0.0001)$. In the multivariate analysis, (table 4, article 3) levels of psychological distress and posttraumatic stress increased with lower levels of perceived available support at 14 months post disaster (CSS1-5), and lower levels of appraisal of the support received after the disaster (CSS7). In the logistic regression including CSS6, significances were found for both GHQ (OR 1.85; CI 1.44-2.38) and IES-R (OR 2.65; CI 2.02-3.49). Some background variables showed significance as well, most notably gender and types of exposure, particularly for those with multiple exposures.

Study III's main findings were that satisfaction with all received support within an index predicted a better psychological outcome, whereas dissatisfaction with at least one support source constituted a risk for psychological symptoms. Associations were found for formalised support, as well as social support.

5.6 *Psychological distress and sick leave in the study group and the population of Stockholm (Study IV)*

In this study the analyses were restricted to respondents older than 18 years, which meant that 42 individuals were excluded from the study group.

The descriptive statistics showed that in all exposure groups except the least exposed one (H), higher scores on the GHQ were reported when compared to the matched population controls. The number of those on sick leave for longer than two weeks during the last year was low in the study group as a whole, and was correlated with higher scores on the GHQ.

The proportional OR estimates for high scores on GHQ in the various exposure groups showed that groups with multiple exposures (A, B, C), life threat and presence on the beach (D), and the sole exposure of life threat (E), had higher odds (ORs 12.54-1.50) compared to the matched population controls (at least $p < 0.01$). The ORs of the other groups (F, G, H) for high scores on GHQ did not differ significantly from the matched population controls (Table 2 in article 2).

The OR estimates for sick leave longer than two weeks in the preceding year in the various exposure groups (Table 3 in article 2), showed that groups with multiple exposures (A, B, C) had higher ORs (14.68-5.78) compared to the matched population controls. The least exposed group (H) showed a lower OR (0.31, CI: 0.19-0.51, $p < 0.001$) for sick leave. ORs for the other groups (D, E, F, G) did not significantly differ from ORs of the matched population controls.

The main findings of Study IV were that the least exposed group reported less sick leave than the population sample, and that survivors who confirmed experiencing only one or two of the stated types of exposures reported similar levels of sick leave, but slightly increased psychological distress, compared to the population sample.

6 DISCUSSION

6.1 General discussion

This thesis spans the distress evoked by the experience of a disaster to the recovery from these stressful experiences. The following discussion will be held in relation to the theoretical model in Fig. 1. Therefore, this section first addresses exposure in the disaster context.

6.1.1 Exposure

Although prior studies have shown that, of various types of stressors, life threat and injury have the strongest and most durable consequences for psychological health, it has been difficult to isolate the relative impact of each exposure, especially since they often appear together. The findings of Study I showed that not only multiple exposures, but also life threat as a single exposure, predicted higher levels of psychological distress and posttraumatic stress. The results for the outcome measures GHQ and IES-R were to a large extent parallel for the different exposure types. The stability of the findings in the analyses for Study I were supported through later analyses with different types of explaining variables in Studies II and III, where the same basic variables showed significance for predicting the outcomes.

Bereavement is an acknowledged risk factor for adverse health outcome following disaster (107, 125, 126, 160). Notably, in this study, bereavement alone did not predict any increase in risk for psychological distress or posttraumatic stress. In fact, this may be explained through the lower frequency of loss of a family member in this group, compared to the other two exposure groups comprising bereavement (see Fig.1). Also, fewer persons in this group were direct witnesses to atrocities when the waves arrived. In the other two groups of bereaved, all individuals experienced life threat and some severe injury, and their increased risk of psychological symptoms is well in accord with studies from other disasters (26).

The reporting of exposures will be dependent on the time at which measurements are made. During the impact phase there is an immediate exposure to the experience of life threat and physical injury. Memories of the experiences during this phase are modified by what happens during later stages, in the form of secondary stressors and available support or lack of support. It is most likely that they are also influenced by the current level of distress. Longitudinal research has shown large inconsistencies in the reporting of potentially

traumatic events over time, for example in a Swiss community-based study (94). In a longitudinal study of Norwegian tsunami survivors, the reporting of life threat was amplified in survivors with persistent posttraumatic symptoms, in contrast to those whose symptoms decreased (90). Hence, in interpreting the reports on exposure, when collateral objective information is not available, we must take into consideration that symptom level, and experiences during the recovery and “back to life” phases of the disaster could influence the reporting, and therefore also may influence associations with outcomes.

Methodologically, the most important contribution of Study I is the isolation of single exposures through a model of categorising exposures (see Fig. 1). First, the exposures that were reported as sole experiences by some participants were singled out. Thus, the items “life threat”, “presence on the beach” and “bereavement” were selected. The item “severe injury” was added but only appeared in conjunction with “presence on the beach” and “life threat”. An item enquiring about retention or loss of control when caught by the wave was found not to contribute information to the aforementioned and was therefore omitted. Further categories were then added with combinations of exposures, as a reflection of how individuals were actually affected. The categorisation enabled the analysis of the impact of exposure to be reduced to a single factor on subsequent psychological symptoms. This model for categorising exposures could probably be used in other trauma contexts.

Although direct comparisons with other disaster studies are risky, a few relevant examples can be mentioned. Weisæth’s investigation of a factory explosion had some parallels to the present study (238). The entire exposed population was studied, and using a within-group design, exposure was categorised in a similar way, and secondary stressors were transient and less severe. Results showed that the posttraumatic stress reactions were for the most part short-lived except for the severely exposed group, and even so all individuals with post-traumatic stress disorder were working two years after the disaster. A study that investigated exposure among civilian non-professionals was performed 10 to 22 months after a commuter train accident in London (204). Here the survivors were compared to a randomly selected group of commuters. In contrast to our study, results did not show any difference between the exposed group as a whole and the non-exposed control group on the GHQ. When different exposures within the study group were taken into account, the IES was sensitive to exposure.

Numerous disaster studies have shown the consequences of extreme exposure for later psychological health (142,160, 165). This study does not add to prior knowledge on this issue. However, there has been less focus on the larger group of moderately exposed, and prior studies have not sufficiently taken into consideration the differential effects of exposure for psychological outcomes. The value of Study I stems from highlighting the consequences of moderate disaster exposure.

There is no disagreement that extremely affected survivors, or people showing severe responses, are in need of immediate help after the impact phase. Among the rest of survivors, many will respond with distress in the first phases of a disaster, but only a minority go on to eventually develop clinical disorders. The early responses, or symptoms, are not prognostic and cannot be used when considering which survivors should be offered later intervention. Screening of everyone affected is hardly an option in large scale disasters. However, it would be valuable to characterise subgroups that carry a heightened risk for prolonged distress, in order to increase the cost-benefit ratio of intervention. Such subgroups have been suggested to consist of those who, for example, suffered multiple losses, or those with a lack of social resources (234), or of individuals whose early symptoms do not improve (33). An implication of Study I may be that one additional factor that could be queried for is the experience of life threat during the impact phase.

6.1.2 Risk factors, in particular life events

In all studies in this thesis, a number of background factors were entered in the various analyses. These were gender, age, educational achievement and living arrangements. Each of these factors carries, to a certain extent, an established potential for ameliorating or aggravating the psychological consequences of disaster. In the analyses, irrespective of which independent variable was of main interest, results for these co-variables were consistent.

Female gender and single living predicted a worse outcome on both measures respectively, in all analyses. This is a consistent finding in disaster research ((160, 165, 227). Consistent differences between findings were noted concerning age, where younger age was associated only with higher levels on GHQ, but not on IES-R, compared to age group 55 years or older. In addition, suicidal ideation was more common among the younger age groups in Study II.

This could be a reflection of differential psychological distress in different age groups in the population, rather than a consequence of the disaster. As has been noted above, the effect of age is influenced by other factors such as culture and socioeconomics. The case is different for education, in that lesser educational achievement was associated with IES-R. This is in accordance with prior studies showing a protective effect of education for posttraumatic stress symptoms (165).

The only significant interaction between co-variables was gender – education (Study I); men with 10-12 years education had a higher OR for significant outcome on IES-R. This result was barely significant, and probably coincidental, since it is hard to explain why intermediate level of education should stand out. However, it is conceivable that education has a differentially protective effect on posttraumatic symptoms for men and women. Well-educated men possibly have access to a tighter social network, and in cases of distress, may be more inclined to seek help. Besides, both of these factors are generally stronger in women.

Of all the background factors, we had a special interest in looking at prior life events as demonstrated in Study II. The motivating force behind investigating life events among disaster survivors was to discover whether those with negative life events had an increased risk for psychological problems after the disaster.

Prior studies have shown adult adverse health consequences of negative life events during childhood and adolescence, for a number of events, and for a number of psychological and physical outcomes (62, 118, 140, 192). Especially assaultive violence and sexual abuse have been shown to be deleterious (46, 54, 55, 118, 150). When childhood adversity is followed later in life by other potentially traumatic situations the risk for PTSD is increased (16, 30, 32, 222). Study II confirmed that this mechanism was also relevant after the tsunami, and for other psychological outcomes. The analyses of the impact of negative life events during childhood and adolescence showed effects on psychological outcomes, despite the powerful impact of the tsunami experience. The effect, however, was small in comparison with the impact of the disaster exposure.

There are many problems pertaining to the reliability of life event data when such is collected retrospectively. For example, respondents' recollection of events may be unreliable or

subject to bias, as when negative recall is over-emphasized in depression (183), or items may be interpreted differently by different responders (53).

There is also a lack of consistency when prior negative life events are reported over time. Recently, Hepp et al (94) published an interview study based on a sample from the general population in Switzerland, where the overall frequency of inconsistent reporting over two time-points six years apart was 64%. Notably, the reporting was more consistent among victims of assaultive and sexual violence, and among those with more PTSD symptoms.

We had expected that particular events should have a particular effect on psychological outcomes; e.g. that prior accidents would be associated with posttraumatic stress through the experience of life threat during the tsunami. The lack of a differential effect may have been caused by the self-report technique which allows only rough queries, in contrast to interviews where responses can be interpreted and expounded. On the other hand, childhood adversities often occur in clusters, and the cumulative effect may be stronger and more non-specific than the particular effect on a particular outcome (11, 118).

Lately, there has been an inflamed discussion regarding the demarcation line between life events and traumatic events (35). This is of utmost importance since the definition of PTSD requires the experience of the latter. Some have argued that even relatively minor events could result in posttraumatic symptoms in some individuals (147). This should speak for probing for a broader array of event types, and also probably for measuring other outcomes than PTSD.

A more general problem in life-event research has been the cultural bias towards US-based studies, since the prevalence of certain life events, primarily violence, is higher in the United States than in other Western societies (6, 94, 113, 116). The weight of other types of events may thus have been underrated in prior studies.

An interesting issue is whether individuals who have experienced prior negative life events have a tendency towards accepting support after disaster. This study has not investigated that question, but the relatively low degree of association between prior life events and later psychological symptoms indicates that other factors are critical in this regard. However,

having knowledge of survivors' prior experiences of negative life events could influence decisions regarding therapy at later stages.

In the context of this thesis, Study II illustrates how predisaster factors influence psychological health after the disaster experience. The case of prior life events also illustrates that predisaster factors do influence later outcomes, but in the first postdisaster stages, levels of distress and peri-event related factors are more central for determining needs of survivors.

6.1.3 Support

The interest in the topic of support emanates from the potential to influence the course of recovery after disaster in a positive way. In other words, could support, and specifically formalised support, act to protect survivors from psychological symptoms in a wider time frame? A part of this question involves understanding how to best investigate and evaluate support. This was the topic of Study III.

Research on support began in studies on general health, and lines of thought have been extrapolated to trauma and disaster. This has resulted in a problematic diversity of formulations of, and measures for, support. There is also terminological vagueness, especially concerning the term social support. Social support is often used, as in this thesis, to describe only private sources of support (e.g. 164), but sometimes includes professional sources of support (e.g. 186). Especially when discussing the possibility of intervention, there is a clear need for differentiation and specification in this area. In particular, there is a need to investigate formalised support. In this study we tried to remedy this by differentiating social support and formalised support.

In Study III, the results of the analyses of different types of support and their reception showed that survivors who reported more psychological distress and posttraumatic stress also had received more support. These results are expected and in accordance with e.g. Wills (249). It would be absurd to conclude that support provoked symptoms. Conversely, we cannot claim that support has ameliorated symptoms. In order to do that a longitudinal design would have been necessary. According to the metastudies of Norris and her associates (160, 165), the effects of received support have in general been inconsistent in prior disaster studies. In Brewin and colleagues' metastudy of risk factors for PTSD for various trauma

types, lack of social support was the second strongest factor (34). In that study, distinction of different aspects of social support was not accounted for. Our results regarding received support are plausible, when considering that individuals with stronger psychological reactions tend to be the ones who get the most support (168, 249).

The next step was to investigate to what extent respondents were satisfied or dissatisfied with the support they had received. In these analyses, a single item pertaining to satisfaction or dissatisfaction was analysed separately for the various forms of received social and formalised support. Results showed that satisfaction with all received support within an index predicted a better psychological outcome, and dissatisfaction with any received support was associated with psychological symptoms. For social support, dissatisfaction increased psychological distress as well as posttraumatic stress. For formalised support, results were more complex, but significances were found for either psychological distress or posttraumatic stress regarding somatic health care and psychological care, and for both outcomes regarding insurance agencies. Unfortunately, a grading of dissatisfaction was not possible due to the low numbers of completely dissatisfied persons.

Carr, for example, found helpfulness of formalised support to be protective against psychological distress, but not against posttraumatic stress, six months and two years after an earthquake (43, 44). I believe, in this case, that such results speak against trying to interpret the differences between the two outcomes. The results demonstrate that the opinion of the received support, whether it was social or formalised support, had an impact on the psychological health of survivors.

The findings were supported in the analyses with the global measure of perceived support in the CSS. Results showed that low levels of satisfaction with received support predicted more psychological distress and posttraumatic stress.

The above is consistent with prior research where perceived support has generally been demonstrated to have a protective effect on the psychological health of trauma victims (34, 179), and disaster survivors specifically (51, 65, 110, 154, 160, 164, 165).

Willis and Shinar have pointed to a general problem of research into the effects of support (249). Since most people are satisfied with support, at least social support, measures tend to

be skewed to the right. The same applies to studies of received support in stressed populations since these individuals tend to activate a lot of support resources. This skew could reduce the sensitivity of either perceived or received support measures for detecting effects of an intervention. A further complication, illustrated by the case of debriefing as an intervention after trauma, is that there is no evident association between satisfaction with the intervention and less psychological symptoms or increased occupational function (42).

Already at the outset, the various support variables showed very different capacities to influence outcomes, even within the social support index. For example, already in the impact phase of the disaster, social support was activated through tangible and sometimes life-saving help from family and peers. Support from the close family was then for most people active more or less continuously through all stages, unless broken through separation. Other types of social support, such as contacts with neighbours or colleagues may have been important only for a certain period of time.

Formalised support was offered to survivors from the rescue phase and onwards (148). Especially when it comes to the emotional aspect of support in the rescue and recovery phases, it is important *how* and *when* survivors are approached and offered support, since this may influence their inclination to seek and accept later support or even therapy.

Dissatisfaction with support can mean many things, as was demonstrated by interviews with tsunami survivors from Stockholm (104, 149). The person can experience not having been helped with symptoms or other problems, or was approached at the wrong time, e.g. when psychological reactions were at a more defensive stage, or when the person is more preoccupied with meeting more basic needs. Instead, survivors may have wanted to be actively approached at point in time when they did not have enough energy to seek out support. Offers may also have been vague, or ambivalent, or insensitive to the person's needs, or in the wrong format, e.g. group meetings when individual contact would have been more acceptable (164, 85). This was reflected in the results on the negative response item in CSS, which correlated to dissatisfaction with both social and formalised support.

Formalised support comprised everything from a single meeting at the primary health care centre to weekly sessions with a psychotherapist over the course of several months. The support measure did not take into account variations in frequency or the points in time of

various types of support. With full awareness of the risk of lumping together such different variables, associations did emerge between psychological health and support.

In Study III, satisfaction and dissatisfaction were measured through a single item. However, there are indications that dissatisfaction has a relatively stronger impact than satisfaction on health, in parallel with negative social interactions being more strongly related to PTSD than positive ones (12, 85, 259). Reasons for this may be that negative interactions diminish the ability of network members to respond to the needs of a person, or that the disappointment resulting from the rejection of potential supporters could be especially deleterious (12, 96, 164). Moreover, it seems to be a basic psychological principle that bad phenomena indeed have greater power than good ones (17). The lesson for intervention would be that it is more important to eliminate “bad” support, than to increase “good” support.

Disaster-stricken populations clearly differ with respect to relationships within the affected group. A distinctive feature of this study group was the large proportion of families. This may have biased results in several ways, e.g. by making responses more homogeneous or by improving options for mutual support, which would imply a buffering effect on symptoms. In order to account for this, analyses were performed adjusted for dependence.

What does this add to prior research?

The investigation of client satisfaction in disaster settings is a relatively new field of inquiry (105, 167), despite the fact that Carr and colleagues investigated this already ten years ago in relation to health (43, 44). Study III demonstrates that in disaster contexts, it is feasible to inquire for the opinion of satisfaction with support, both social and formalised support. Secondly, dissatisfaction with support can be an important indicator either that the support is inadequate, or that dissatisfied individuals are in need of more or other kinds of help and support.

Crisis Support Scale

The study gave rise to some reflections on CSS. The retrospective usage of the scale clearly shifts the purport of the items away from the disaster in present tense, thus reflecting less of received support and more of perceived support. We found retrospective usage to consist of three factors, the first being a reflection of actually available perceived support (items 1-5). According to Sarason, this would be more of a personality variable (201). The item

measuring negative response to support (item 6) is often counted with the first factor in reversed scoring. There are two arguments against such a procedure. First, one cannot assume that a negative item is automatically equally balanced by a positive item. Dissatisfaction indeed seems stronger than satisfaction. Secondly, in the two-factor analysis it loaded on both the other factors. We decided to analyse it as a separate factor and found that it was associated with both psychological distress and posttraumatic stress. The third factor (item 7) seems to measure overall satisfaction with received support. There were no interactions with gender. In contrast, in a study by Andrews, Brewin and Rose on victims of non-domestic violence, this item was found to be more important among women than men for the development of PTSD (12). This difference is perhaps explained by the nature of different exposures.

In short, CSS is a complex instrument measuring multiple aspects of support. It may also behave differently within different trauma contexts. In contrast to this global instrument, our measures were directly associated with concrete sources of support.

6.1.4 Recovery

To be able to discuss courses of recovery, one should ideally have both predisaster data, and more than one postdisaster point of measurement (71, 172). The lack of data before the impact event meant that there was no way of knowing whether the symptoms reported arose after the event, or if they were merely a continuation of prior distress. In this way, studies lacking predisaster data have sometimes falsely attributed high rates of psychopathology to a disaster (174). The cross-sectional design of the study made it impossible to differentiate between those who responded with distress and then recovered, and those that were resilient from the beginning. In other words, the trajectories of recovery, and the impact of positive or negative factors on recovery up to the point of data collection, are difficult to illuminate within this design. This problem is common for many disaster studies. In the absence of such data, one option is to select a comparison group that resembles the study group as much as possible. One solution has been to select a whole community similar to the affected one (45, 214). Another has been to recruit individuals in a similar situation to the affected people (204). In research on disasters affecting groups of veterans or workers, it has been possible to match participants on individual characteristics (e.g. 97). When non-professional groups are affected, the issue is more complex. To my knowledge, no one has been able to perform any

matching of groups for more than a few variables under these circumstances. The matching of the two groups in Study IV on as many as eight variables is exceptional. With all the above reservations in mind, it is now possible to discuss aspects of recovery on the basis of the studies in the thesis.

With extreme stress, symptoms and dysfunction are expected to appear for almost everyone in the first postdisaster stages (172). In other words, *resistance* is an uncommon response in this group. This is reflected in our results in Study I where the majority of the most severely exposed in group A (see Fig. 1) were still symptomatic at 14 months, and in Study IV, where this group clearly had a higher risk for psychological distress and lower levels of functioning than the comparison group.

Concerning the other two multiply exposed groups, B and C, only half of the participants were symptomatic at 14 months after the disaster (descriptive data Study I). In this category with severe but varying degrees of exposure, some survivors may have experienced only minimal dysfunction, implying a response of *resistance*. Others may have gone through strong emotional and behavioural responses, but at measurement 14 months after the disaster, these were settled, thus implying a course of *resilience*. Yet others were still symptomatic at 14 months. The number of those in this last category whose symptoms will eventually be resolved, implying a course of *recovery*, can only be answered by a longitudinal follow-up.

In the groups reporting life threat only, including those present on the beach (groups D and E), almost a third of participants were symptomatic at 14 months (descriptive data Study I), implying a significantly higher risk for symptoms than the comparison group. However, when occupational function was analysed, no differences appeared in comparison to the population. This incongruence between symptom reporting and functional level points to another dimension of understanding recovery processes. Survivors may be functioning well in one domain (e.g. as a parent) while simultaneously suffering from depression or posttraumatic symptoms (209). It is conceivable that success in one domain (e.g., return to work) may lead to more positive self-appraisal and thereby contribute to a better general outcome (209). This also concerns the clinical relevance of registered symptoms (211). It may be that many simply express transient responses that are not necessarily accompanied by dysfunction, and therefore do not imply a negative prognosis. In that case, intervention need not be a choice. On the other hand, among those who are symptomatic and not dysfunctional,

a vulnerability for subsequent negative events is conceivable. Altogether, we know too little about symptom expression and functional impairment in the context of recovery. To improve this, various domains of psychological symptoms and performance need to be assessed independently, and repeatedly.

For the least exposed group it is possible to benefit from Heir's and Weisøeth's study on Norwegian tsunami survivors (92). They found that witnessing many dead bodies, or abandoned children, which were common experiences in our least exposed group, predicted psychological distress six months after the disaster. In Study IV, at 14 months, the level of psychological distress in this group was indistinguishable from the population. This points to an expected course of *recovery* for a part of this group during the second half of the year after the tsunami. This group also had a significantly higher occupational function in comparison to the population, which points to *resilience* as common for moderately exposed survivors. People perhaps valued their ability to work, and the social connectedness it brings, especially in light of the fresh memories of having survived the tsunami. Some individuals may also have achieved a good performance in the work domain, despite experiencing emotional problems (209). People who are exposed to greater perceived threat and harm generally report higher levels of growth (132). However, the relation between the level of adversity and growth seems not to be a linear one, since there are reports that benefits are stronger at intermediate levels of exposure (66, 128, 202). The findings in the present study would concur with this curvi-linear relationship between traumatic exposure and psychological benefits.

All together, with the exception of the most exposed individuals, the majority of survivors seemed to fare reasonably well 14 months after the disaster. For most of those who still showed symptoms, it is, following Shalev, reasonable to presume that these symptoms are adaptive, rather than signs of future psychopathology, provided the absence of specific pathogenic factors (208). For this majority, stress-management is the preferred approach from the part of helpers. For a minority, treatment of symptoms will be necessary.

6.2 Methodological Issues

6.2.1 The study group

In natural disasters, the population affected is normally extant (centripetal disasters). In contrast, the participants in this study were at the site temporarily as holidaymakers, they were abruptly exposed to the tsunami, and then quickly evacuated (centrifugal disasters). In this regard, the study group more resembled survivors of transportation accidents, where people coming together temporarily are dispersed after the event. Importantly, in contrast to the situation for the residents around the Indian Ocean, there was only limited destructive impact of the disaster on human networks, income sources, and infrastructure for the study group. This group was also, not only on a global scale, but also in a Swedish context, socioeconomically privileged. These circumstances reduced the need for having to adjust for these factors, which usually act as strong confounders in centripetal disasters. For these reasons, this study came close to a quasi-natural experiment.

It is important to discuss the representativeness of the study group. The group was not sampled but consisted of practically all travellers registered upon arrival from Southeast Asia within a certain time frame. A few survivors were lost since they managed to arrive before the 27th of December 2004 when registration commenced. The same is true for those survivors who arrived after the 15th of January 2005 when registration was discontinued. From the total group, 55% were lost due to non-response. Is this a serious obstacle to the group being representative? Although the response rate may seem low, it is comparable to or higher than in other disaster studies, including tsunami studies made in other European countries (6, 86, 92, 123). Secondly, since location of departure was not registered, the police registration lists contained large numbers of people who returned from other parts of Southeast Asia, and a number of these individuals responded to the questionnaire. It is reasonable to assume that non-response was more common in this group with no direct experience of the disaster.

In trauma research, it has been speculated that more symptomatic individuals may be less inclined to participate, the reason being the tendency to avoid reminders, as a part of PTSD (161). On the other hand, there are indications that trauma survivors in many instances want to contribute for the benefit of others. Weisæth's group approached nonparticipants to the Norwegian counterpart of the present study, and compared them to those who did respond

(103). They found that posttraumatic stress symptoms were positively associated with participation, and that the most important reasons for not participating were lack of interest or time (39%), and lack of relevant experiences (32%). Notably, more women (22%) than men (10%) among non-responders found the study too personal or emotionally disturbing. Nota bene that emotional reactions to the questionnaire were presumably of more importance at 6 months, the time-point of the Norwegian investigation, than our time-point 14 months. In summary, although there are no strong indications that non-response influenced the main outcomes, when so, the reporting of psychological symptoms may have been exaggerated. This would support the findings of relative resilience in Study IV.

Selection bias occurs if responders differ from those not responding on key variables. This is often a large problem in studies of disasters, since participants seldom can be recruited before the study event. In this case, non-response was more common among men, and younger age groups, which is the rule in population research (75, 84, 168). To partly compensate for this, we performed a weighting of respondents on these two factors. Unweighted results differed slightly from weighted results for GHQ: with weighting, the levels of significance were changed in some cases, but only one age group (35-44) showed significance in the unweighted analysis and lost it in the weighted analysis. In the opposite direction, the two exposure groups “life threat” and “life threat and beach”, showed significance only with weighting. For IES there were only some minor changes in significance levels. Unfortunately we had no information on other factors in the non-response group (84).

Within the study group, there were no systematic differences in background variables between different exposure groups. In disaster contexts, information on exposure and posttraumatic symptoms is particularly important for the issue of selection bias. This is a problem, since one must often draw samples, which can consist of a diversity of individuals from large geographic areas. Consequently, the study group in the present work was confined to those who reported having been in the disaster area at the time of the wave, and were thus exposed to some degree..

Against the generalisability of findings speaks the fact that the study group, and consequently the matched comparison group in Study IV, were to a large extent born in Sweden. This does not reflect the true composition of the population of Sweden today, and this may have

consequences on psychological health after severe incidents, since the Swedish-born have been exposed to violence and war to a lesser extent /368/.

6.2.2 Time point of measurement

The time point of measurement should be determined by the questions one wants to answer. In this study the main issues were the impact of exposure on one hand, and the importance of support on the other, with regard to psychological symptoms.

When collecting data too early following an event, reporting will be influenced to a large extent by acute responses that have low predictive value on later dysfunction or psychopathology. On the other hand, data on initial responses are more accurate when collected early, and the reporting of various kinds of information has been found to be inconsistent upon repeated questioning (90, 174). For most survivors, distress and symptoms begin to fade during the rescue phase, and when data is collected later than the recovery phase, the majority will not report much disaster related distress. If any inferences on the mechanisms of recovery are to be made, with the limitations of a cross-sectional design, measurements must be undertaken somewhere between these two points. Although the time-point of data collection at 14 months post disaster was dictated more by practical circumstances than by intention, it falls in the accurate time-frame for the purposes of the study.

6.2.3 Measures

When selecting measures for mental health, some issues are particularly important to consider. Interviews are needed to make full diagnostic assessments. With a group of the present size, this is hardly feasible. Moreover, since the primary outcomes of this study are the responses of a large group of civil non-patients, which does not imply an expectation to find a high prevalence of psychiatric disorders, non-diagnostic symptom checklists should be sufficient. Such checklists are also much easier to apply.

Until recently, the interest in disaster studies has to a very large extent focused on PTSD as an outcome (160). Although a minority do develop PTSD, and are in need of psychiatry, an exaggerated focus on this condition tends to give inordinate attention to psychopathology, which in turn distorts the view of what most survivors need in the aftermath of disasters.

Therefore, the GHQ as outcome in the study is important. On afterthought, other non-psychiatric measures could have been of interest when considering the needs of survivors. For example, more elaborate measures of psychosocial function, or concerning independent variables, coping or self-efficacy instruments could have added to the understanding of distress and recovery.

GHQ

The GHQ, which is widely used in disaster studies, was chosen with the intention to capture general psychological symptoms, and the 12-item version was selected since this was used in the population survey that served as comparison. Besides, it is very easy to administrate. A problem with this kind of scale in investigations of nonpatient-populations is that data is strongly skewed to the left. With the recommended cut-off point, data was dichotomised at the 75th percentile. This means that, with a dichotomisation, in order to perform logistic regression, information is invariably lost. To compensate for this, GHQ was treated as an ordinal variable in Study IV. One would expect this to have an attenuating effect on results (34), but significances in the exposure groups were essentially unchanged, which demonstrates the robustness of data.

IES

The IES-R is composed of three subscales, corresponding to the three dimensions of the diagnosis of PTSD in DSM-IV. It is possible to use IES-R either with the sum of the three subscales, or with these three as separate outcomes. In the literature, the instrument has been proposed to consist of different numbers of factors (14, 19, 39, 231). Just as with the original IES (101), there has been a discussion as to whether the subscales differentiate less well in survivors with lower symptom levels, which means that in these instances the instrument should rather be used with the subscales summated (52). In the case of this work, it is an argument in favour of summation. Initial analyses were performed with subscales, but later on, summated scores were computed, since it was judged that the additional information given by separate analyses for the subscales was negligible.

As for GHQ, data for IES-R are strongly skewed. For IES-R, there is no commonly accepted cut-off, since the scale is not intended to be used for diagnostic purposes. In the case of this study, we chose to dichotomise to avoid having to use different statistical methods for our psychological outcome measures. The choice of the 75th percentile as threshold was actually

quite arbitrary but is commonly used, and landed the cut-off at 32/33, which was on level with other studies (14, 52).

Suicidal ideation

One item from Paykel's suicidal scale (184) was used to query for suicidal ideation. Unfortunately, in this item, suicidal ideation was set at a lower level than the suicidal question in the population survey, which precluded a comparison in Study IV.

Sick leave

A problem with many trauma studies is that functional limitations are not clearly differentiated from symptom reporting. Also, it is often not taken into consideration that the impairment of function criterion of PTSD is not included in versions of DSM prior to DSM-IV (2, 3). In the two large reviews of disaster studies of 2002 and 2006 by Norris et al (160, 165) impairment is used interchangeably with symptom level, although outcomes related to function are discussed (e.g. as psychosocial resource loss), and studies with DSM-III and DSM-IV-criteria are not separately discussed. This is an important issue, especially when data is collected through questionnaires, since the meaning of psychological distress in the absence of impaired functioning is intriguing (74). Indeed, in many population studies as well as in some disaster studies, functional limitations are explicitly addressed (84).

Since the issue of functional limitation after disaster is a neglected area of study, we decided to use sick leave as a proxy for function. Admittedly, this is a crude, although global, measure, and a measure only of occupational function. Preferably, measures of social participation and forms of activity performance should have been applied.

6.2.4 General strengths and weaknesses

Strengths

The first major strength of this study was the large size and composition of the study group. In studies of centrifugal disasters, which in this case are most relevant for comparison, study groups tend to be smaller. Conversely, in studies of natural disasters, sampled study groups can be large, but exposure is often not clearly demarcated. In contrast, this study group was not sampled, and the whole group was exposed to some extent. Furthermore, the study group

probably had low rates of psychopathology before the disaster, and the impact of secondary stressors due to the disaster was limited, which reduced the need for control of these potential confounders. Results were only marginally modified by weighting and by adjustment for family clusters. This compensated partly for the limits posed by the cross-sectional design, and made findings more robust and generalizable.

The second major strength was that the study took into account the impact of the diversity of individual disaster exposure. The categorisation of different exposures, and the control for these in the analyses, enabled the investigation of the impact of single exposures. There were no important differences in background data between exposure groups. With the exception of Study IV, analyses were performed with a within-group design, with the least exposed group as a reference. In this group as well, many individuals were exposed to distressing encounters, which Heir and Weisøeth (92) showed implied increased risks for symptoms at six months after the tsunami. This would imply that the elevated “risks” for symptoms among exposed were not exaggerated.

A third strength was the comparison with a matched population sample in Study IV, which made findings more robust and generalizable, in addition to illuminating the process of recovery, even with the cross-sectional design of the study.

A further strength was that data was shown to be robust since outcomes for the main variables were only marginally changed through a large number of analyses with different co-variables. The outcome instruments are widely used and well-validated (although formally not in the Swedish versions).

Other specific strengths were, in Study IV, the usage of GHQ as an ordinal scale, and the control for borough of residence and birth in Sweden, which are indicators of social economic status.

Limitations

Most of the limitations have already been touched upon. However, some general comments have to be made. On a general level, it is worth pointing out that the sole reliance on quantitative methods sets limits to the understanding of health aspects of disaster, and the prevention of adverse consequences. To elucidate other important dimensions, quantitative

research should be supplemented with qualitative methods. This point became evident in this thesis particularly for the issue of support.

An obvious limitation which follows from the cross-sectional design of the study is that it is not possible to make any inferences on causality between factors.

7 Conclusion

The present study demonstrates the possibility to differentiate exposures into combinations of single exposures and isolated single exposures. First, in agreement with prior research, it confirmed the impact of severe and multiple exposure during disaster for subsequent psychological health. More importantly, it highlighted the impact of single exposure factors, notably the experience of life threat, for the larger group of victims who were moderately exposed. It confirmed that the prior established gender difference in psychological responses after disaster is also valid when the exposure is identical for both genders. In addition, it showed that occupational function may be maintained despite psychological symptoms. As an example of the impact of pre-disaster factors, prior experience of adverse life events during childhood and adolescence was shown to have an influence on psychological health, despite the powerful effect of the disaster. A key element of the study was that it differentiated social and formalised support, and showed that survivors with more symptoms received the most support after the tsunami. Also, perceived social support, measured as satisfaction with received support, predicted levels of psychological symptoms. Furthermore, the thesis illuminated the issue of dissatisfaction with support, and pointed to the importance of eliminating unsatisfying support, rather than focusing solely on increasing good support. Finally, despite the cross-sectional design, the comparison with a matched group from the general population enabled a discussion of different courses of recovery after the disaster.

8 Implications for intervention

Following disasters, many of those affected respond with strong emotions, and go through a period of turmoil. Over time, the majority of individuals return to their previous levels of functioning, without suffering much despite horrific experiences. A recent problem in the discussion on intervention after trauma has been an ambivalence regarding what can be done for survivors without interfering in the natural recovery process. Since the debriefing debate, a very cautious attitude has prevailed towards early intervention, as illustrated by the homepage of NCPTSD. An obvious reason for this has been the former dominance of a pathologizing perspective. Another has been the trend to standardise guidelines for intervention (208), leading to measures such as the recent formulation of “a strong consensus against early application of formal intervention universally for all” (23). What then can be done for survivors of disasters? In the rescue and recovery phases, all survivors should be approached with tact and respect for individual psychological responses, based on a knowledge of crisis theory. For most individuals, when these encounters are professional and positively charged, this is sufficient, provided the existence of adequate social support. For people who have been heavily exposed to atrocities, or who have suffered multiple losses, formalised support and help are most often needed even when social support is strong. For those who display pronounced or persistent signs of distress, or lack sources of support, formalised support and help should be offered.

Turning to the more specific implications of this study: First, following disasters, affected individuals could be asked what they have been through. If they report experiences involving life threat, they could at a later point in time be approached by outreach programmes and be screened for symptoms and needs. This does not affect those at the extreme end of exposure, since survivors with higher levels of distress, or those with multiple losses, should already have been offered help and support at earlier stages. When survivors are questioned, measures of symptoms and dysfunction should be supplemented with measures of positive experiences and performance. Also, investigating survivors’ opinions of support should be standard after disasters. Support reported as unsatisfying should be pinpointed and scrutinized, and individuals dissatisfied with support should be approached and offered alternative support from other sources or in other formats.

9 Future research

On the basis of this thesis, it is possible to envision further research in several directions on the recovery processes of people who have gone through disastrous events.

Studies like the present one should be conducted within a longitudinal framework. For example, Adams and colleagues found that exposure during the World Trade Center Disaster predicted lower psychological well-being one year after the event (8). In a second wave of data two years after the disaster, exposure was no longer significant as a predictor of psychological well-being (9). The authors speculate that this has to do with the richness of resources in a country like the US, in contrast to many less developed regions of the world. However, in their study they did not look differentially at various types of exposure. An important corroboration of the present work would be to see if the differential impact of exposure on psychological health remains in follow-up measurements of the study group.

A longitudinal design is also necessary for the illumination of the process of recovery. Specifically, changes in symptoms and in functional domains should be followed. A more general point to make is that the study of recovery and resilience should not be limited to negative or pathological phenomena (209). Since the effects of exposure to adverse events are not only negative, instruments should be bi-directional.

Studies with qualitative data are needed (180). Especially concerning the design of support after trauma, research must take into account the complexity of this field. Support must be conceived of as dynamic, i.e. appearing and changing in the context of time. It is also an interactive process. It starts with the needs of a person, but is highly influenced by how the person is approached, a position or process described by the Swedish word *bemötande*, which curiously seems to lack a precise English translation. The dimensions of social support described earlier must be customised to formalised support, and in this process qualitative research is clearly needed to clarify the meanings attributed to various conceptualisations.

Studies on intervention after trauma have become more common in recent years (see 133 for an overview). However, this has almost exclusively focused on survivors with severe symptoms. On the whole, there is a paucity of studies specifically on intervention after disasters, and research on how to approach the great majority of survivors with the intention of preventing severe consequences is only just emerging (195). In relation to the present

work, issues on the associations between social support and formalised support, and satisfaction with various support types, should be investigated in an intervention framework. Adjacent issues include the organisation of support and help – an area of increasing attention in disaster mental health literature (1, 195).

In this thesis, the study group was exclusively from one city region. The Stockholm County Council has a well-organised disaster preparedness system, including medical and psychological resources, and a close collaboration with social resources through the municipality (148). Therefore, the types of available formal support were similar for the entire group. A comparison with the survivors from other regions of Sweden could shed light on how this major city aspect may have influenced the courses of recovery. It may also give new insights into the role of social and formalised support for recovery.

The reporting of somatic signs (255), and subjective symptoms (165, 202) even in the absence of severe injury, is increased following disasters. A future study should include measures for physical symptoms.

There are some gender issues that are particularly interesting in relation to this work. For example, do women and men differ in their responses during the impact phase, and if so what consequences does this have in the long run? Other questions are whether the needs of women and men are paid attention to differentially, and whether women and men would benefit from different forms of support.

Finally, although the entire work in this thesis was approached and interpreted from a psychological level, this does not exclude a biological perspective, which became most apparent in Study II. The experience of adverse events early in life gives rise to brain-physiological changes, which have an impact on the susceptibility for psychological symptoms after a disaster. However, the collection of biological specimens or application of brain imaging techniques are difficult in disaster contexts. Instead, the biological input to disaster studies comes largely from the partly overlapping field of PTSD research. It is unclear how valuable that knowledge may be since, unfortunately, data from these studies is almost exclusively collected from patient groups, and not from populations similar to those struck by disasters. Since the collecting of specimen from disaster victims will continue to be

a challenge, an option could be to study psychological and biological facets in accident victims.

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Och **Elias** och **Einar** som fick mig att få rull på cykeln.

11 Sammanfattning på svenska

Upplevelsen av en katastrof kommer hos nästan alla som drabbas att utlösa en krisreaktion, bestående av psykiska reaktioner och beteenden. För de flesta är reaktionen övergående och bara en mindre andel får bestående psykiska besvär. Forskningen har visat att vissa faktorer som har direkt med katastrofen att göra, såsom upplevelsen av hot till livet, fysisk skada och förlust av närstående, medför en högre risk för senare ohälsa. Det har emellertid varit svårt att värdera betydelsen av enskilda faktorer eftersom dessa oftast förekommer tillsammans i olika kombinationer. Det är dessutom försvårande att varje katastrof är unik. Betydelsen av olika bakgrundsfaktorer för psykisk ohälsa efter katastrofupplevelser är till stor del klarlagd och i huvudsak gemensam med den som gäller för psykisk ohälsa generellt. Däremot har betydelsen av negativa upplevelser under uppväxten för ohälsa efter katastrof inte belysts tidigare.

Vid naturkatastrofer påverkas drabbade ofta under lång tid av den förstörelse som katastrofen medfört. Tsunamikastrofen 2004 innebar en unik möjlighet att studera en grupp drabbade som kunde återvända till i huvudsak intakta relationer och bibehållen försörjning, boende och infrastruktur. Det gjorde det möjligt att särskilt belysa enskilda faktors betydelse för senare ohälsa samt att studera återhämtningen för andra grupper än de mest extremt drabbade.

Frågan om intervention för drabbade efter katastrofer har diskuterats intensivt på senare tid och på sina håll lett till en återhållsam inställning till rekommendationer om erbjudanden om stöd och hjälp. Det är visat att socialt stöd, särskilt om det av drabbade upplevs som tillgängligt, är gynnsamt för återhämtningen efter en katastrof. Vad gäller formaliserat stöd återstår många frågor att utforska.

Det övergripande syftet med avhandlingen var att undersöka en naturkatastrofs inverkan på den psykiska hälsan hos de överlevande, med särskilt beaktande av olika typer av exponering för katastrofen, riskfaktorer och socialt stöd för återhämtningen.

Studien byggde på en enkät insamlad 14 månader efter tsunamin. Denna besvarades av 1505 personer över 16 år boende i Stockholm, vilka hade befunnit sig i det drabbade området under katastrofen. Olika exponeringar under katastrofen (livshot, allvarlig fysisk skada, förlust och vistelse på stranden/i vattnet när vågorna kom) kategoriserades och kontrollerades för i alla analyser vilket även gällde för ett antal bakgrundsfaktorer. I delarbete IV användes också data

från personer som besvarat Folkhälsoenkäten 2006 för Stockholms län. Dessa matchades med tsunamidrabbade avseende åtta variabler. Huvudutfall i alla fyra delarbeten var psykiska besvär i form av allmän psykisk ohälsa och posttraumatiska stressymtom, mätta med två validerade instrument. Som utfall i delarbete II användes också självmordstankar, och i delarbete IV sjukskrivning.

Resultaten visade att personer som upplevt kombinationer av flera exponeringar under katastrofen rapporterade mest besvär. Delarbete I visade också att de som enbart upplevt hot till livet hade en högre benägenhet att rapportera psykiska besvär. Som exempel på bakgrundsfaktors betydelse visade delarbete II ett samband mellan negativa upplevelser under uppväxten och psykisk ohälsa efter katastrofen trots exponeringens starka genomslagskraft. I delarbete III gjordes en kategorisering av erhållet stöd i index som socialt stöd, respektive stöd från olika formaliserade stödkällor (kroppssjukvård och psykisk sjukvård/behandling, stödgrupper, försäkringsinstanser). Bland personer som rapporterade tillfredsställelse med alla stödkällor inom ett index var andelen med psykisk ohälsa lägre, medan bland dem som rapporterade missnöje med något av stöden var andelen med psykisk ohälsa högre. Dessa samband gällde för såväl socialt stöd som det formaliserade stödet. Delarbete IV som jämförde den katastrofdrabbade gruppen med ett befolkningsurval visade som förväntat att de värst drabbade hade högre benägenhet för psykisk ohälsa än befolkningen. Vidare att drabbade som upplevt en eller två av de efterfrågade exponeringarna hade något ökad benägenhet för psykisk ohälsa jämfört med befolkningen medan nivån av sjukskrivning inte gick att skilja åt mellan de två grupperna. Den minst exponerade gruppen hade klart lägre sannolikhet för sjukskrivning under det sista året i jämförelse med befolkningsgruppen.

Slutsatser som kan dras av avhandlingen är att de flesta katastrofdrabbade kan förväntas klara sig bra på sikt vad gäller den psykiska hälsan med det stöd som närstående kan ge. Detta under förutsättning att katastrofens nedbrytande verkan på infrastruktur, försörjning och relationer är begränsad och att bemötandet efteråt från samhälle och sjukvård kännetecknas av kunskap om riskfaktorer, krisreaktioner och adekvat krisstöd. De personer som vid katastrofer drabbas av exceptionellt svåra upplevelser och/eller av flera förluster behöver följas upp och erbjudas stödjande insatser utöver närståendes stöd, även om det sistnämnda är gott.

Avhandlingen pekar på nödvändigheten av att som en del av sjukvårdens bemötande av katastrofdrabbade fråga dessa vad de varit med om. Om det framkommer upplevelser av livshot finns enligt denna studie en ökad risk för psykisk ohälsa. Dessa personer bör därför i ett senare skede sökas upp för att screenas för psykisk ohälsa och återstående behov. Vid kontakten med drabbade bör man i tillägg till frågor om psykiska reaktioner också undersöka funktionsnivå. Avhandlingen har dessutom visat betydelsen av drabbades värdering av den hjälp och det stöd man fått för den senare psykiska hälsan. I bemötandet av drabbade bör därför också ingå att dessa tillfrågas om vad man tycker om stödet. Vid uttryckt missnöje bör stödet granskas särskilt och den drabbade erbjudas stöd i annan form eller från annat håll än det man hittills fått.

12 References

1. Adm Policy Ment Health. 2009;159-214.
2. *Diagnostic and statistical manual of mental disorders Fourth ed.*
Washington, DC: American Psychiatric Press; 1994.
3. *Diagnostic and statistical manual of mental disorders Third ed..*
Washington, DC: American Psychiatric Press 1980.
4. /<http://www.ekonomifakta.se/sv/Fakta/Regional-statistik/Alla-lan/Stockholms-lan/?var=2642> , retrieved 4th Feb 2010/.
5. Journal of Traumatic Stress.
6. Review of the experiences of United Kingdom nationals affected by the Indian Ocean Tsunami. London: National Audit Office; 2006.
7. (NDAS) CWLoANDAS. Number of Child Victims of Abuse and Neglect, 2006.
http://ndas.cwla.org/data_stats/access/predefined/Report.asp?PageMode=1&ReportID=134&GUID={68E82498-13FD-4D98-A666-6920BAC0E679}#Table. 2009.
8. Adams RE, Boscarino JA. Stress and Well-Being in the Aftermath of the World Trade Center Attack: the Continuing Effects of a Communitywide Disaster. *J Community Psychol.* 2005;33:175-190.
9. Adams RE, Boscarino JA, Galea S. Social and psychological resources and health outcomes after the World Trade Center disaster. *Soc Sci Med.* 2006;62:176-188.
10. Allebeck P, Backhans M, Greitz B, Heimerson, I, Kark, M Public Health Report 2007. Available at:
<http://www.folkhalsoguiden.se/upload/folkh%c3%a4lsoarbete/Folkh%c3%a4lso rapport%202007.pdf>. Accessed September 8, 2008.
11. Anda RF, Felitti VJ, Bremner JD, Walker JD, Whitfield, C, Perry, BD, Dube, SR, Giles, WH. The enduring effects of abuse and related adverse experiences in childhood. A convergence of evidence from neurobiology and epidemiology. *Eur Arch Psychiatry Clin Neurosci.* 2006;256:174-186.
12. Andrews B, Brewin CR, Rose S. Gender, social support, and PTSD in victims of violent crime. *J Trauma Stress.* 2003;16:421-427.
13. Armenian HK, Morikawa M, Melkonian AK, Hovanesian AP, Haroutunian N, Saigh PA, Akiskal K, Akiskal HS. Loss as a determinant of PTSD in a cohort of adult survivors of the 1988 earthquake in Armenia: implications for policy. *Acta Psychiatr Scand.* 2000;102:58-64.
14. Asukai N, Kato H, Kawamura N, Kim Y, Yamamoto K, Kishimoto J, Miyake Y, Nishizono-Maher A. Reliability and validity of the Japanese-language version of the impact of event scale-revised (IES-R-J): four studies of different traumatic events. *J Nerv Ment Dis.* 2002;190:175-182.
15. Averill PM, Beck JG. Posttraumatic stress disorder in older adults: a conceptual review. *J Anxiety Disord.* 2000;14:133-156.
16. Banyard VL, Williams LM, Siegel JA. The long-term mental health consequences of child sexual abuse: an exploratory study of the impact of multiple traumas in a sample of women. *J Trauma Stress.* 2001;14:697-715.
17. Baumeister RF, Bratslavsky E, Finkenauer C, Vohs K. Bad is stronger than good. *Review of General Psychology.* 2001;5:323-370.
18. Baumert J, Simon H, Gundel H, Scmitt C, Ladwig KH. The Impact of Event Scale-Revised: Evaluation of the subscales and correlations to psychophysiological startle response patterns in survivors of a life-threatening

- cardiac event: an analysis of 129 patients with an implanted cardioverter defibrillator. *J Affect Disord.* 2004;82:29-41.
19. Beck JG, Grant DM, Read JP, Clapp JD, Coffey SF, Miller LM, Palyo SA. The impact of event scale-revised: psychometric properties in a sample of motor vehicle accident survivors. *J Anxiety Disord.* 2008;22:187-198.
20. Ben-Ezra M, Aluf D. Traumatic events v. life events: does it really matter? *Br J Psychiatry.* 2006;188:83-84.
21. Benight CC, McFarlane AC. Challenges for disaster research: recommendations for planning and implementing disaster mental health studies. *Journal of Loss & Trauma.* 2007;12:419-434.
22. Benight CC, Swift E, Sanger J, Smith E, Zeppelin D. Coping self-efficacy as a mediator of distress following a natural disaster. *Journal of Applied Social Psychology.* 1999;29:2443-2464.
23. Bisson JI, Tavakoly B, Witteveen AB, Adjukovic D, Jehel L, Johansen V, Nordanger D, Orengo Garcia F, Punamäki RL, Schnyder U, Sezgin AU, Wittman L, Olf M. TENTS guidelines: development of post-disaster psychosocial care guidelines through a Delphi process. *Br J Psychiatry.* 2010;196:69-74.
24. Bodvarsdottir I, Elklit A. Psychological reactions in Icelandic earthquake survivors. *Scand J Psychol.* 2004;45:3-13.
25. Bolin R, Stanford L. Constructing vulnerability in the first world: The Northridge earthquake in southern California, 1994. In: Oliver-Smith A, Hoffman S, eds. *The angry earth: Disaster in anthropological perspective.* New York: Routledge; 1999:89-112.
26. Bonanno G, Galea SS, Bucciarelli A, Vlahov D. Psychological resilience after disaster. New York City in the aftermath of the September 11th terrorist attack. *Psychological Science.* 2006;17:181-186.
27. Bonanno GA, Galea S, Bucciarelli A, Vlahov D. What predicts psychological resilience after disaster? The role of demographics, resources, and life stress. *J Consult Clin Psychol.* 2007;75:671-682.
28. Boscarino JA, Adams RE. PTSD onset and course following the World Trade Center disaster: findings and implications for future research. *Soc Psychiatry Psychiatr Epidemiol.* 2009.
29. Bravo M, Rubio-Stipec M, Canino GJ, Woodbury MA, Ribera JC. The psychological sequelae of disaster stress prospectively and retrospectively evaluated. *Am J Community Psychol.* 1990;18:661-680.
30. Bremner JD, Southwick SM, Johnson DR, Yehuda R, Charney DS. Childhood physical abuse and combat-related posttraumatic stress disorder in Vietnam veterans. *Am J Psychiatry.* 1993;150:235-239.
31. Breslau N. The Epidemiology of Trauma, PTSD, and Other Posttrauma Disorders. *Trauma Violence Abuse.* 2009;10:198-210.
32. Breslau N, Chilcoat HD, Kessler RC, Davis GC. Previous exposure to trauma and PTSD effects of subsequent trauma: results from the Detroit Area Survey of Trauma. *Am J Psychiatry.* 1999;156:902-907.
33. Brewin CR. Risk factor effect sizes in PTSD: what this means for intervention. *J Trauma Dissociation.* 2005;6:123-130.
34. Brewin CR, Andrews B, Valentine JD. Meta-analysis of risk factors for posttraumatic stress disorder in trauma-exposed adults. *J Consult Clin Psychol.* 2000;68:748-766.

35. Brewin CR, Lanius RA, Novac A, Schnyder U, Galea S. Reformulating PTSD for DSM-V: Life after Criterion A. *J Trauma Stress*. 2009;366-373.
36. Briere J, Elliott D. Prevalence, characteristics, and long-term sequelae of natural disaster exposure in the general population. *J Trauma Stress*. 2000;13:661-679.
37. Brown SL, Nesse RM, Vinokur AD, Smith DM. Providing social support may be more beneficial than receiving it: results from a prospective study of mortality. *Psychol Sci*. 2003;14:320-327.
38. Brunet A, Boyer R, Weiss DS, Marmar CR. The effects of initial trauma exposure on the symptomatic response to a subsequent trauma. *Canadian Journal of Behavioural Science/Revue canadienne des sciences du comportement*. 2001;33:97-102.
39. Brunet A, St-Hilaire A, Jehel L, King S. Validation of a French version of the impact of event scale-revised. *Canadian journal of psychiatry*. 2003;48:56-61.
40. Bryant RA. Early predictors of posttraumatic stress disorder. *Biol Psychiatry*. 2003;53:789-795.
41. Cahill SP, Foa EB. Psychological theories of PTSD In: Friedman MJ, Keane TM, Resick PA, eds. *Handbook of PTSD: Science and practice*. New York: Guilford; 2007.
42. Carlier IV, Voerman AE, Gersons BP. The influence of occupational debriefing on post-traumatic stress symptomatology in traumatized police officers. *Br J Med Psychol*. 2000;73 (Pt 1):87-98.
43. Carr VJ, Lewin TJ, Webster RA, Hazell PL, Kenardy JA, Carter GL. Psychosocial sequelae of the 1989 Newcastle earthquake: I. Community disaster experiences and psychological morbidity 6 months post-disaster. *Psychol Med*. 1995;25:539-555.
44. Carr VJ, Lewin TJ, Webster RA, Kenardy JA. A synthesis of the findings from the Quake Impact Study: a two-year investigation of the psychosocial sequelae of the 1989 Newcastle earthquake. *Soc Psychiatry Psychiatr Epidemiol*. 1997;32:123-136.
45. Catapano F, Malafronte R, Lepre F, Cozzolino P, Arnone R, Lorenzo E, Tartaglia G, Starace F, Magliano L, Maj M. Psychological consequences of the 1998 landslide in Sarno, Italy: a community study. *Acta Psychiatr Scand*. 2001;104:438-442.
46. Chapman DP, Whitfield CL, Felitti VJ, Dube SR, Edwards VJ, Anda RF. Adverse childhood experiences and the risk of depressive disorders in adulthood. *J Affect Disord*. 2004;82:217-225.
47. Cobb S. Presidential Address-1976. Social support as a moderator of life stress. *Psychosom Med*. 1976;38:300-314.
48. Collogan LK, Tuma F, Dolan-Sewell R, Borja S, Fleischman AR. Ethical issues pertaining to research in the aftermath of disaster. *J Trauma Stress*. 2004;17:363-372.
49. Connor KM, Foa EB, Davidson JR. Practical assessment and evaluation of mental health problems following a mass disaster. *J Clin Psychiatry*. 2006;67 Suppl 2:26-33.
50. Connor KM, Zhang W. Recent advances in the understanding and treatment of anxiety disorders. Resilience: determinants, measurement, and treatment responsiveness. *CNS Spectr*. 2006;11:5-12.
51. Cook JD, Bickman L. Social support and psychological symptomatology following a natural disaster. *Journal of Traumatic Stress*. 1990;3:1990.

52. Creamer M, Bell R, Failla S. Psychometric properties of the Impact of Event Scale - Revised. *Behav Res Ther.* 2003;41:1489-1496.
53. Dohrenwend BP. Inventorying stressful life events as risk factors for psychopathology: Toward resolution of the problem of intracategory variability. *Psychol Bull.* 2006;132:477-495.
54. Dube SR, Anda RF, Felitti VJ, Chapman DP, Williamson DF, Giles WH. Childhood abuse, household dysfunction, and the risk of attempted suicide throughout the life span: findings from the Adverse Childhood Experiences Study. *Jama.* 2001;286:3089-3096.
55. Dube SR, Anda RF, Felitti VJ, Edwards VJ, Croft JB. Adverse childhood experiences and personal alcohol abuse as an adult. *Addictive behaviors.* 2002;27:713-725.
56. Ehlers A, Mayou R, Bryant R. Psychological predictors of chronic PTSD after motor vehicle accidents. *J Abnorm Psychol.* 1998;107:508-519.
57. Eid J, Larsson G, Johnsen BH, Laberg JC, Bartone PT, Carlstedt B. Psychometric properties of the Norwegian Impact of Event Scale-Revised in a non-clinical sample. *Nord J Psychiatry.* 2009:1-7.
58. Ekeberg Ø, Skogstad L, Myhrer SH. [Tsunami--impact on survivors and next of kin]. *Tidsskr Nor Lægeforen.* 2008;128:1939-1943.
59. Elklit A, Pedersen SS, Jind L. The Crisis Support Scale: Psychometric qualities and further validation. *Personality and Individual Differences.* 2001;31:1291-1302.
60. EmergencyManagementAustralia. Emergency Management Practice, Vol 3, Guidelines for Psychological Services Practice. In: Department A-Gs, ed.: Emergency Management Australia; 2003.
61. Falk B, Hersen M, Van Hasselt VB. Assessment of posttraumatic stress disorder in older adults: a critical review. *Clinical psychology review.* 1994;14:383-415.
62. Felitti VJ, Anda RF, Nordenberg D, Williamson DF, Spitz AM, Edwards V, Koss MP, Marks JS. Relationship of childhood abuse and household dysfunction to many of the leading causes of death in adults. The Adverse Childhood Experiences (ACE) Study. *American journal of preventive medicine.* 1998;14:245-258.
63. Finnsdottir T, Elklit A. Posttraumatic sequelae in a community hit by an avalanche. *J Trauma Stress.* 2002;15:479-485.
64. Fleischman AR, Collogon L, Tuma F. Ethical issues in disaster research. In: Norris FH, Galea S, Friedman MJ, et al., eds. *Methods for disaster mental health research* New York: The Guilford Press; 2006.
65. Fleming R, Baum A, Gisriel MM, Gatchel RJ. Mediating influences of social support on stress at Three Mile Island. *J Human Stress.* 1982;8:14-22.
66. Fontana A, Rosenheck R. Psychological benefits and liabilities of traumatic exposure in the war zone. *J Trauma Stress.* 1998;11:485-503.
67. Frans O, Rimmo PA, Åberg L, Fredrikson M. Trauma exposure and post-traumatic stress disorder in the general population. *Acta Psychiatr Scand.* 2005;111:291-299.
68. Friedman MJ, Keane TM, Resick PA. *Handbook of PTSD: Science and practice.* New York: Guilford; 2007.
69. Fullerton CS, Ursano RJ. Psychological and psychopathological consequences of disasters. In: López-Ibor JJ, Christodoulou G, Maj M, et al., eds. *Disasters and mental health.* Chichester: Wiley; 2005:13-36.

70. Galea S, Ahern J, Resnick H, Kilpatrick D, Bucuvalas M, Gold J, Vlahov D. Psychological sequelae of the September 11 terrorist attacks in New York City. *N Engl J Med*. 2002;346:982-987.
71. Galea S, Maxwell AR, Norris F. Sampling and design challenges in studying the mental health consequences of disasters. *International journal of methods in psychiatric research*. 2008;17 Suppl 2:S21-28.
72. Galea S, Nandi A, Stuber J, Gold J, Acierno R, Best CL, Bucuvalas M, Rudenstine S, Boscarino JA, Resnick H. Participant reactions to survey research in the general population after terrorist attacks. *J Trauma Stress*. 2005;18:461-465.
73. Galea S, Nandi A, Vlahov D. The epidemiology of post-traumatic stress disorder after disasters. *Epidemiol Rev*. 2005;27:78-91.
74. Galea S, Norris F. Public mental health surveillance and monitoring. In: Norris F, Galea S, Friedman MJ, et al., eds. *Methods for disaster mental health research*. New York: Guilford; 2006:177-193.
75. Galea S, Tracy M. Participation rates in epidemiologic studies. *Ann Epidemiol*. 2007;17:643-653.
76. Galea S, Tracy M, Norris F, Coffey SF. Financial and social circumstances and the incidence and course of PTSD in Mississippi during the first two years after Hurricane Katrina. *J Trauma Stress*. 2008;21:357-368.
77. Gao F, Luo N, Thumboo J, Fones C, Li SC, Cheung YB. Does the 12-item General Health Questionnaire contain multiple factors and do we need them? *Health Qual Life Outcomes*. 2004;2:63.
78. Gersons BP. Historical background: social psychiatry and crisis theory. In: Ørner R, Schnyder U, eds. *Reconstructing early intervention after trauma: innovations in the care of survivors*. Oxford: Oxford University Press; 2003:14-23.
79. Goenjian AK, Walling D, Steinberg AM, Karayan I, Najarian LM, Pynoos R. A prospective study of posttraumatic stress and depressive reactions among treated and untreated adolescents 5 years after a catastrophic disaster. *Am J Psychiatry*. 2005;162:2302-2308.
80. Goldberg DP, Gater R, Sartorius N, Ustun TB, Piccinelli M, Gureje O, Rutter C. The validity of two versions of the GHQ in the WHO study of mental illness in general health care. *Psychol Med*. 1997;27:191-197.
81. Goldberg DP, Williams P. *A user's guide to the General Health Questionnaire*. Berkshire: Nfer-Nelson Publishing Comp; 1988.
82. Gray MJ, Litz BT, Hsu JL, Lombardo TW. Psychometric properties of the life events checklist. *Assessment*. 2004;11:330-341.
83. Green BL. Cross-national and ethnocultural issues in disaster research. In: Marsella AJ, Friedman MJ, Gerrity ET, Scurfield RM, eds. *Ethnocultural aspects of posttraumatic stress disorder*. Washington, DC: American psychological Association; 1996:341-361.
84. Grievink L, van der Velden PG, Yzermans CJ, Roorda J, Stellato RK. The importance of estimating selection bias on prevalence estimates shortly after a disaster. *Ann Epidemiol*. 2006;16:782-788.
85. Guay S, Billette V, Marchand A. Exploring the links between posttraumatic stress disorder and social support: processes and potential research avenues. *J Trauma Stress*. 2006;19:327-338.

86. Harjajärvi M, Kiikkala I, Pirkola S. One and a half year after the Tsunami. Psychosocial care in Finland in the wake of the natural disaster in Asia. Helsinki: National Research and Development Centre for Welfare and Health 2007:71.
87. Havenaar JM, Bromet EJ. The experience of the Chornobyl nuclear disaster. In: López-Ibor JJ, Christodoulou G, Maj M, et al., eds. *Disasters and mental health* Chichester: Wiley; 2005:179-192.
88. Havenaar JM, Rumyantzeva GM, van den Brink W, Poelijoe NW, van den Bout J, van Engeland H, Koeter MW. Long-term mental health effects of the Chernobyl disaster: an epidemiologic survey in two former Soviet regions. *Am J Psychiatry*. 1997;154:1605-1607.
89. Heim C, Nemeroff CB. The role of childhood trauma in the neurobiology of mood and anxiety disorders: preclinical and clinical studies. *Biol Psychiatry*. 2001;49:1023-1039.
90. Heir T, Piatigorsky A, Weisæth L. Longitudinal changes in recalled perceived life threat after a natural disaster. *Br J Psychiatry*. 2009;194:510-514.
91. Heir T, Sandvik L, Weisæth L. Hallmarks of Posttraumatic Stress: Symptom Z-Scores in a Tsunami-Affected Tourist Population. *Psychopathology*. 2009;42:157-164.
92. Heir T, Weisæth L. Acute disaster exposure and mental health complaints of Norwegian tsunami survivors six months post disaster. *Psychiatry*. 2008;71:266-276.
93. Heir T. Back to where it happened: self-reported symptom improvement of Tsunami survivors who returned to the disaster area. *Prehospital and disaster medicine*. 2006;21:59-63.
94. Hepp U, Gamma A, Milos G, Eich D, Ajdacic-Gross V, Angst J, Schnyder U. Inconsistency in reporting potentially traumatic events. *Br J Psychiatry*. 2006;188:278-283.
95. Ho D, Imai K, King G, Stuart EA. Matching as nonparametric preprocessing for reducing model dependence in parametric causal inference. *Political Analysis*. 2007;15:199-236.
96. Hobfoll SE, Watson P, Bell CC, Bryant RA, Brymer Mj, Friedman MJ, Friedman M, Gersons BP, de Jong JT, Layne CM, Maguen S, Neria Y, Norwood AE, Pynoos RS, Reissman D, Ruzek JI, Shalev AY, Solomon Z, Steinberg AM, Ursano RJ. Five essential elements of immediate and mid-term mass trauma intervention: empirical evidence. *Psychiatry*. 2007;70:283-315; discussion 316-269.
97. Holen A. A long-term outcome study of survivors from a disaster. The Alexander L. Kielland disaster in perspective. *Department of disaster psychiatry, Gaustad*. Oslo: Oslo; 1990:220.
98. Hollifield M, Hewage C, Gunawardena CN, Kodituwakku P, Bopagoda K, Weerathnege K. Symptoms and coping in Sri Lanka 20-21 months after the 2004 tsunami. *Br J Psychiatry*. 2008;192:39-44.
99. Horesh N, Klomek AB, Apter A. Stressful life events and major depressive disorders. *Psychiatry Res*. 2008;160:192-199.
100. Horowitz MJ. *Stress response syndromes*. Northvale, N.J.: Jason Aronson; 2001.
101. Horowitz MJ, Wilner N, Alvaraez W. Impact of Event Scale: a measure of subjective stress. *Psychosom Med*. 1979;41:209-218.
102. House JS. *Work stress and social support*. Reading, MA: Addison-Wesley; 1981.

103. Hussain A, Weisæth L, Heir T. Nonresponse to a population-based postdisaster postal questionnaire study. *J Trauma Stress*. 2009;22:324-328.
104. Högeling Drozin A, Michélsen H, Schulman A. På jakt efter en metod för psykologiskt stöd - utvärdering av frivilliga stödgrupper för drabbade av tsunamikatastrofen. *CeFAM Rapport* 2008:1. Stockholm: Center for Family and Community Medicine 2008.
105. Jackson CT, Allen G, Essock SM, Felton CJ, Donahue SA. Clients' satisfaction with Project Liberty counseling services. *Psychiatr Serv*. 2006;57:1316-1319.
106. Jensen TK, Dyb G, Nygaard E. A longitudinal study of posttraumatic stress reactions in Norwegian children and adolescents exposed to the 2004 tsunami. *Arch Pediatr Adolesc Med*. 2009;163:856-861.
107. Johannesson KB, Lundin T, Hultman CM, Lindam A, Dyster-Aas J, Arnberg F, Michel PO. The effect of traumatic bereavement on tsunami-exposed survivors. *J Trauma Stress*. 2009;22:497-504.
108. Johannesson KB, Michel PO, Hultman CM, Lindam A, Arnberg F, Lundin T. Impact of exposure to trauma on posttraumatic stress disorder symptomatology in Swedish tourist tsunami survivors. *J Nerv Ment Dis*. 2009;197:316-323.
109. Joseph S. Social support and mental health following trauma. In: Yule W, ed. *Post-traumatic stress disorders Concepts and therapy*. Chichester: Wiley; 1998:71-91.
110. Joseph S, Andrews B, Williams R, Yule W. Crisis support and psychiatric symptomatology in adult survivors of the Jupiter cruise ship disaster. *The British journal of clinical psychology / the British Psychological Society*. 1992;31 (Pt 1):63-73.
111. Joseph SA, Brewin CR, Yule W, Williams R. Causal attributions and psychiatric symptoms in survivors of the Herald of Free Enterprise disaster. *Br J Psychiatry*. 1991;159:542-546.
112. Joseph SA, Williams R, Yule W. Crisis support, attributional style, coping style, and post-traumatic symptoms. *Personality and Individual Differences*. 1992;13:1249-1251.
113. Kangaspunta K, Joutsen M, Ollus N, eds. *Crime and Criminal Justice Systems in Europe and North America, 1990-1994* New York: United Nations European Institute for Crime Prevention and Control (HEUNI) Finland; 1998
114. Kaniasty K, Norris FH. In search of altruistic community: patterns of social support mobilization following Hurricane Hugo. *Am J Community Psychol*. 1995;23:447-477.
115. Kaniasty K, Norris FH. A test of the social support deterioration model in the context of natural disaster. *J Pers Soc Psychol*. 1993;64:395-408.
116. Kazantzis N, Flett RA, Long NR, MacDonald C, Millar M, Clark B. Traumatic events and mental health in the community: a New Zealand study. *The International journal of social psychiatry*. 56:35-49.
117. Keane TM, Kolb LC, Kaloupek DG, Orr SP, Blanchard EB, Thomas RG, Hsieh FY, Lavori PW. Utility of psychophysiological measurement in the diagnosis of posttraumatic stress disorder: results from a Department of Veterans Affairs Cooperative Study. *J Consult Clin Psychol*. 1998;66:914-923.
118. Kessler RC, Davis CG, Kendler KS. Childhood adversity and adult psychiatric disorder in the US National Comorbidity Survey. *Psychol Med*. 1997;27:1101-1119.
119. Kilpatrick DG, Koenen KC, Ruggiero KJ, Acierno R, Galea S, Resnick HS, Roitzsch J, Boyle J, Gelernter J. The serotonin transporter genotype and social

- support and moderation of posttraumatic stress disorder and depression in hurricane-exposed adults. *Am J Psychiatry*. 2007;164:1693-1699.
120. Kimerling R, Ouimette P, Weitlauf JC. Gender issues and PTSD. In: Friedman MJ, Keane TM, Resick PA, eds. *Handbook of PTSD Science and practice*. New York: Guilford; 2007:207-228.
 121. Kornør H, Weisæth L, Winje D, Ekeberg Ø, Daae C, Swensen E, Tinderholt Myrhaug H, Ormstad S. Psykososiale tiltak ved store ulykker og katastrofer. In: Røttingen J-A, ed. Oslo: Nasjonalt kunnskapssenter for helsetjenesten; 2006:39.
 122. Kraemer B, Wittmann L, Jenewein J, et al. Is the stressor criterion dispensable?: a contribution to the criterion A debate from a Swiss sample of survivors of the 2004 tsunami. *Psychopathology*. 2009;42:333-336.
 123. Kraemer B, Wittmann L, Jenewein J, Maier T, Schnyder U. 2004 Tsunami: long-term psychological consequences for Swiss tourists in the area at the time of the disaster. *Aust N Z J Psychiatry*. 2009;43:420-425.
 124. Krakow B, Haynes PL, Warner TD, Santana E, Melendrez D, Johnston L, Hollifield M, Sisley BN, Koss M, Shafer L. Nightmares, insomnia, and sleep-disordered breathing in fire evacuees seeking treatment for posttraumatic sleep disturbance. *J Trauma Stress*. 2004;17:257-268.
 125. Kristensen P, Weisæth L, Heir T. Predictors of complicated grief after a natural disaster: A population study two years after the 2004 South-East Asian Tsunami. *Death Studies*. 2010;34:137-150.
 126. Kristensen P, Weisæth L, Heir T. Psychiatric disorders among disaster bereaved: an interview study of individuals directly or not directly exposed to the 2004 tsunami. *Depress Anxiety*. 2009;26:1127-1133.
 127. Lazarus RS, Folkman S. *Stress, appraisal and coping*. New York: Springer; 1984.
 128. Lechner SC, Carver CS, Antoni MH, Weaver KE, Phillips KM. Curvilinear associations between benefit finding and psychosocial adjustment to breast cancer. *J Consult Clin Psychol*. 2006;74:828-840.
 129. Leskin GA, Sheikh JI. Lifetime trauma history and panic disorder: findings from the National Comorbidity Survey. *J Anxiety Disord*. 2002;16:599-603.
 130. Levine C. The concept of vulnerability in disaster research. *J Trauma Stress*. 2004;17:395-402.
 131. Lindgaard CV, Iglebaek T, Jensen TK. Changes in family functioning in the aftermath of a natural disaster: The 2004 tsunami in Southeast Asia. *Journal of Loss & Trauma*. 2009;14:101-116
 132. Linley PA, Joseph S. Positive change following trauma and adversity: a review. *J Trauma Stress*. 2004;17:11-21.
 133. Litz BT, Gray MJ. Early intervention for trauma in adults. In: Litz BT, ed. *Early intervention for trauma and traumatic loss*. New York: Guilford; 2004.
 134. López-Ibor JJ, Christodoulou G, Maj M, Sartorius N, Okasha A, eds. *Disasters and mental health*. Chichester: Wiley; 2005.
 135. Lundin T, Jansson L. Traumatic impact of a fire disaster on survivors-a 25-year follow-up of the 1978 hotel fire in Borås, Sweden. *Nord J Psychiatry*. 2007;61:479-485.
 136. Maes M, Mylle J, Delmeire L, Altamura C. Psychiatric morbidity and comorbidity following accidental man-made traumatic events: incidence and risk factors. *Eur Arch Psychiatry Clin Neurosci*. 2000;250:156-162.

137. Marshall GN, Schell TL, Elliott MN, Rayburn NR, Jaycox LH. Psychiatric disorders among adults seeking emergency disaster assistance after a wildland-urban interface fire. *Psychiatr Serv.* 2007;58:509-514.
138. Marshall RD, Amsel L, Suh EJ. Response to McNally and Breslau (2008). *American Psychologist.* 2008;63:283-285.
139. McCaughey BG, Hoffman KJ, Llewellyn CH. The human experience of earthquakes. In: Ursano RJ, McCaughey BG, Fullerton CS, eds. *Individual and community responses to trauma and disaster: The structure of human chaos.* Cambridge: Cambridge; 1994.
140. McCauley J, Kern DE, Kolodner K, Dill L, Schroeder AF, DeChant HK, Ryden J, Derogatis LR, Bass ED. Clinical characteristics of women with a history of childhood abuse: unhealed wounds. *Jama.* 1997;277:1362-1368.
141. McFarlane AC. Life events and psychiatric disorder: the role of a natural disaster. *Br J Psychiatry.* 1987;151:362-367.
142. McFarlane AC. Psychiatric morbidity following disasters: epidemiology, risk and protective factors. In: López-Ibor JJ, Christodoulou G, Maj M, et al., eds. *Disasters and mental health.* Chichester: Wiley; 2005:37-64.
143. McFarlane AC, Atchison M, Rafalowicz E, Papay P. Physical symptoms in post-traumatic stress disorder. *J Psychosom Res.* 1994;38:715-726.
144. McFarlane AC, Norris FH. Definitions and concepts in disaster research. In: Norris FH, Galea S, Friedman MJ, Watson PJ, eds. *Methods for disaster mental health research.* New York: The Guilford Press; 2006:3-19.
145. McFarlane AC, Van Hooff M. Impact of childhood exposure to a natural disaster on adult mental health: 20-year longitudinal follow-up study. *Br J Psychiatry.* 2009;195:142-148.
146. McNally RJ. Psychological mechanisms in acute response to trauma. *Biol Psychiatry.* 2003;53:779-788.
147. McNally RJ, Breslau N. Does virtual trauma cause posttraumatic stress disorder? *Am Psychol.* 2008;63:282-283; discussion 283-285.
148. Michélsen H, Schulman A, Håkanson E, Hultman C. Tillbaka i Stockholm - nådde stödet fram? *CeFAM Rapport* 2007:1. Stockholm: Center for Family and Community Medicine 2007.
149. Michélsen H, Schulman A, Therup Svedenlöf C, Lingsten I. Nådde hjälpen fram? Psykologiskt och socialt stöd i en kommun vid tsunamin och en trafikolycka. *CeFAM Rapport* 2009:1. Stockholm: Center for Family and Community Medicine; 2009.
150. Min M, Farkas K, Minnes S, Singer T. Impact of childhood abuse and neglect on substance abuse and psychological distress in adulthood. *J Trauma Stress.* 2007;20:833-844.
151. Mol SS, Arntz A, Metsemakers JF, Dinant GJ, Vilters-van Montfort PA, Knottnerus JA. Symptoms of post-traumatic stress disorder after non-traumatic events: evidence from an open population study. *Br J Psychiatry.* 2005;186:494-499.
152. Mollica RF, Caspi-Yavin Y, Bollini P, Truong T, Tor S, Lavelle J. The Harvard Trauma Questionnaire. Validating a cross-cultural instrument for measuring torture, trauma, and posttraumatic stress disorder in Indochinese refugees. *J Nerv Ment Dis.* 1992;180:111-116.
153. Morgan C, Hill S, Fox P, Kingham P, Soutwick SM. Anniversary reactions in Gulf War veterans: A follow-up inquiry 6 years after the war. *Am J Psychiatry.* 1999;156:1075-1079.

154. Murphy SA. Mediating effects of intrapersonal and social support on mental health 1 and 3 years after a natural disaster. *J Trauma Stress*. 1988;1:155-172.
155. Murthy RS. The experience of the Bhopal disaster. In: López-Ibor JJ, Christodoulou G, Maj M, et al., eds. *Disasters and mental health* Chichester: Wiley; 2005:193-200.
156. Neria Y, Nandi A, Galea S. Post-traumatic stress disorder following disasters: a systematic review. *Psychol Med*. 2008;38:467-480.
157. Newman E, Kaloupek DG. The risks and benefits of participating in trauma-focused research studies. *J Trauma Stress*. 2004;17:383-394.
158. NICE NICE. The management of PTSD in adults and children in primary and secondary care. *National Clinical practice Guideline* London: National Collaborating Centre for Mental Health; 2005.
159. Norris F, Foster J, Weisshaar D. The epidemiology of sex differences in PTSD across developmental, societal, and research contexts. In: Kimerling R, Ouimette P, Wolfe J, eds. *Gender and PTSD*. New York: Guilford; 2002:3-42.
160. Norris F, Friedman H, Watson P, Byrne P, Diaz E, Kaniasty K. 60,000 Disaster victims speak: Part I. An empirical review of the empirical literature, 1981-2001. *Psychiatry*. 2002;65:207-239.
161. Norris F, Galea S, Friedman MJ, Watson P, eds. *Methods for disaster mental health research*. New York: Guilford; 2006.
162. Norris F, Perilla JL, Ibañez GE, Ibañez GE, Murphy AD. Sex differences in symptoms of posttraumatic stress disorder: Does culture play a role? *J Trauma Stress*. 2001;14:7-28.
163. Norris FH, Alegria M. Promoting disaster recovery in ethnic-minority individuals and communities. In: Ritchie EC, Watson P, Friedman M, eds. *Interventions following mass violence and disasters Strategies for mental health practice*. New York: The Guilford Press; 2006:319-342.
164. Norris FH, Baker CK, Murphy AD, Kaniasty K. Social support mobilization and deterioration after Mexico's 1999 flood: effects of context, gender, and time. *Am J Community Psychol*. 2005;36:15-28.
165. Norris FH, Elrod C. Psychosocial consequences of disaster. A review of past research. In: Norris FH, Galea S, Friedman MJ, Watson P, eds. *Methods for disaster mental health research*. New York: The Guilford Press; 2006:20-42.
166. Norris FH, Friedman MJ, Watson PJ. 60,000 disaster victims speak: Part II. Summary and implications of the disaster mental health research. *Psychiatry*. 2002;65:240-260.
167. Norris FH, Hamblen JL, Rosen CS. Service characteristics and counseling outcomes: lessons from a cross-site evaluation of crisis counseling after hurricanes katrina, rita and wilma. *Adm Policy Ment Health*. 2009;36:176-185.
168. Norris FH, Kaniasty K. Received and perceived social support in times of stress: a test of the social support deterioration deterrence model. *J Pers Soc Psychol*. 1996;71:498-511.
169. Norris FH, Murphy AD, Baker CK, Perilla JL. Severity, timing, and duration of reactions to trauma in the population: an example from Mexico. *Biol Psychiatry*. 2003;53:769-778.
170. Norris FH, Perilla JL, Riad JK, Kaniasty K, Lavizzo EA. Stability and change in stress, resources and psychological distress following natural disaster: findings from hurricane Andrew. *Anxiety, Stress, and Coping*. 1999;12:363-396.

171. Norris FH, Stevens SP, Pfefferbaum B, Wyche KF, Pfefferbaum RL. Community resilience as a metaphor, theory, set of capacities, and strategy for disaster readiness. *Am J Community Psychol*. 2008;41:127-150.
172. Norris FH, Tracy M, Galea S. Looking for resilience: understanding the longitudinal trajectories of responses to stress. *Soc Sci Med*. 2009;68:2190-2198.
173. North CS, Nixon SJ, Shariat S, Mallonee S, McMillen JC, Spitznagel EL, Smith EM. Psychiatric disorders among survivors of the Oklahoma City bombing. *Jama*. 1999;282:755-762.
174. North CS, Norris FH. Choosing research methods to match research goals in studies of disaster or terrorism. In: Norris FH, Galea S, Friedman MJ, Watson P, eds. *Methods for disaster mental health research*. New York: The Guilford Press; 2006:45-61.
175. Nugent NR, Amstadter AB, Koenen KC. Genetics of post-traumatic stress disorder: informing clinical conceptualizations and promoting future research. *Am J Med Genet C Semin Med Genet*. 2008;148C:127-132.
176. Olde E, Kleber RJ, van der Hart O, Pop V. Childbirth and Posttraumatic Stress Responses: A Validation Study of The Dutch Impact of Event Scale-Revised. *European Journal of Psychological Assessment Vol 22(4) 2006*, 259-267. 2006.
177. Olff M, Langeland W, Draijer N, Gersons BP. Gender differences in posttraumatic stress disorder. *Psychol Bull*. 2007;133:183-204.
178. Ørner R, Schnyder U. Progress made towards reconstructing early intervention after trauma: principles of evidence based practice. In: Ørner R, Schnyder U, eds. *Reconstructing early intervention after trauma Innovations in the care of survivors*. Oxford: Oxford University Press; 2003:267-279.
179. Ozer EJ, Best SR, Lipsey TL, Weiss DS. Predictors of posttraumatic stress disorder and symptoms in adults: a meta-analysis. *Psychol Bull*. 2003;129:52-73.
180. Palinkas L. Qualitative approaches to studying the effects of disasters. In: Norris FH, Galea S, Friedman MJ, Watson P, eds. *Methods for disaster mental health research* New york: Guilford:158-173.
181. Parkes CM. Bereavement following disasters. In: Stroebe M, Hansson RO, Schut H, Stroebe W, eds. *Handbook of bereavement research and practice*. Washington DC: American Psychological Association; 2008:463-484.
182. Paunovic N, Öst LG. Psychometric properties of a Swedish translation of the Clinician-Administered PTSD Scale-Diagnostic Version. *J Trauma Stress*. 2005;18:161-164.
183. Paykel ES. The evolution of life events research in psychiatry. *J Affect Disord*. 2001;62:141-149.
184. Paykel ES, Myers JK, Lindenthal JJ, Tanner J. Suicidal feelings in the general population: a prevalence study. *Br J Psychiatry*. 1974;124:460-469.
185. Peleg T, Shalev AY. Longitudinal studies of PTSD: overview of findings and methods. *CNS Spectr*. 2006;11:589-602.
186. Pina AA, Villalta IK, Ortiz CD, Gottschall AC, Costa NM, Weems CF. Social support, discrimination, and coping as predictors of posttraumatic stress reactions in youth survivors of Hurricane Katrina. *J Clin Child Adolesc Psychol*. 2008;37:564-574.
187. Prigerson HG, Maciejewski PK, Reynolds CF, 3rd, Bierhals AJ, Newsom JT, Fasiczka A, Frank E, Doman J, Miller M. Inventory of Complicated Grief: a scale to measure maladaptive symptoms of loss. *Psychiatry Res*. 1995;59:65-79.

188. Raphael B, Taylor M, McAndrew V. Women, catastrophe and mental health. *Aust N Z J Psychiatry*. 2008;42:13-23.
189. Rasmusson AM, Friedman MJ. Gender issues in the neurobiology of PTSD. In: Kimerling R, Ouimette P, Wolfe J, eds. *Gender and PTSD*. New York: Guilford; 2002:43-75.
190. REK. Regional katastrofmedicinsk plan för Stockholms läns landsting. Stockholms läns landsting; 2006.
191. Renck B, Weisæth L, Skarbo S. Stress reactions in police officers after a disaster rescue operation. *Nord J Psychiatry*. 2002;56:7-14.
192. Reynolds JR, Turner RJ. Major life events: their personal meaning, resolution, and mental health significance. *J Health Soc Behav*. 2008;49:223-237.
193. Richter R, Flowers T. Gendered dimensions of disaster care: critical distinctions in female psychosocial needs, triage, pain assessment, and care. *Am J Disaster Med*. 2008;3:31-37.
194. Rind B, Tromovitch P, Bauserman R. A meta-analytic examination of assumed properties of child sexual abuse using college samples. *Psychol Bull*. 1998;124:22-53.
195. Ritchie EC, Watson PJ, Friedman MJ. *Interventions following mass violence and disasters*. New York: The Guilford Press; 2006.
196. Rosen GM, Lilienfeld SO. Posttraumatic stress disorder: an empirical evaluation of core assumptions. *Clin Psychol Rev*. 2008;28:837-868.
197. Rubonis AV, Bickman L. Psychological impairment in the wake of disaster: the disaster-psychopathology relationship. *Psychol Bull*. 1991;109:384-399.
198. Ruzek JI, Young BH, Cordova MJ, et al. Integration of disaster mental health services with emergency medicine. *Prehospital Disaster Med*. 2004;19:46-53.
199. Råholm M-B, Arman M, Rehnsfeldt A. The immediate lived experiences of the 2004 tsunami disaster by Swedish tourists. *J Advanced Nursing*. 2008;63:597-606.
200. Saari S. Kamratstöd under professionell ledning och den psykiska återhämtningen efter tsunamin. Finlands Röda Kors psykologiska kamratstöd för de omkomnas anhöriga. Finlands Röda kors; 2006:64.
201. Sarason I, Pierce G, Sarason B. General and specific perceptions of social support. In: Avison V, Gotlib I, eds. *Stress and mental health Contemporary issues and prospects for the future*: Springer; 1994:151-178.
202. Schnurr PP, Green BL. *Trauma and health. Physical health consequences of exposure to extreme stress* Washington, DC: American Psychological Association; 2004.
203. Schwarzer R, Knoll N. Functional roles of social support within the stress and coping process: a theoretical and empirical overview. *International Journal of Psychology*. 2007;42:243-252.
204. Selly C, King E, Peveler R, Osala K, Martin N, Thompson C. Post-traumatic stress disorder symptoms and the Clapham rail accident. *Br J Psychiatry*. 1997;171:478-482.
205. Shalev AY. Acute stress reactions in adults. *Biol Psychiatry*. 2002;51:532-543.
206. Shalev AY. Psychobiological perspectives on early reactions to traumatic events. In: Ørner R, Schnyder U, eds. *Reconstructing early intervention after trauma: Innovations in the care of survivors*. Oxford: Oxford; 2003:57-64.
207. Shalev AY. Stress versus traumatic stress. From acute homeostatic reactions to chronic psychopathology. In: van der Kolk BA, McFarlane AC, Weisaeth L,

- eds. *Traumatic Stress: The effects of overwhelming experience on mind, body and society* New York: Guilford; 1996:77-101.
208. Shalev AY, Adessky R, Boker R, Bargai N, Cooper R, Freedman S, Hadar H, Peri T, Tuval-Mashiach R. Clinical interventions for survivors of prolonged adversities. In: Ursano RJ, Fullerton CS, Norwood AE, eds. *Terrorism and disaster Individual and community mental health interventions*. Cambridge: Cambridge; 2003:162-188.
209. Shalev AY, Errera YLE. Resilience is the default: how not to miss it. In: Blumenfield M, Ursano RJ, eds. *Intervention and resilience after mass trauma*. Cambridge: Cambridge; 2008:149-172.
210. Shalev AY, Freedman S, Peri T, Brandes D, Sahar T, Orr SP, Pitman RK. Prospective study of posttraumatic stress disorder and depression following trauma. *Am J Psychiatry*. 1998;155:630-637.
211. Shalev AY, Tuval-Mashiach R, Hadar H. Posttraumatic stress disorder as a result of mass trauma. *J Clin Psychiatry*. 2004;65 Suppl 1:4-10.
212. Shalev AY, Ursano RJ. Mapping the multidimensional picture of acute responses to traumatic stress. In: Ørner R, Schnyder U, eds. *Reconstructing early intervention after trauma*. Oxford: Oxford University Press; 2003.
213. Shalev AY, Yehuda R, McFarlane AC, eds. *International handbook of human response to trauma*. New York: Kluwer Academic/Plenum Publishers; 2000.
214. Shore JH, Tatum EL, Vollmer WM. Psychiatric reactions to disaster: the Mount St. Helens experience. *Am J Psychiatry*. 1986;143:590-595.
215. Silove D, Bryant R. Rapid assessments of mental health needs after disasters. *Jama*. 2006;296:576-578.
216. Silove D, Zwi AB. Translating compassion into psychosocial aid after the tsunami. *Lancet*. 2005;365:269-271.
217. Silverman W, La Greca A. Children experiencing disasters: Definitions, reactions, and predictors of outcomes. In: La Greca A, Silverman W, Vernberg E, Roberts MC, eds. *Helping children cope with disasters and terrorism*. Washington, DC: American Psychological Association; 2002.
218. Smid GE, Mooren TT, van der Mast RC, Gersons BP, Kleber RJ. Delayed posttraumatic stress disorder: systematic review, meta-analysis, and meta-regression analysis of prospective studies. *J Clin Psychiatry*. 2009;70:1572-1582.
219. Socialstyrelsen. Estoniakatastrofen. M/S Estonias förlisning i Östersjön den 28 september 1994. KAMEDO Report No 68. Stockholm; 1997.
220. Socialstyrelsen. Flyghaveriet vid Gottröra den 27 december 1991. KAMEDO Report No 63. Stockholm; 1994.
221. Solomon S. Gender differences in response to disaster. In: Weidner G, ed. *Heart disease: Environment, stress and gender*. Amsterdam: IOS Press; 2002.
222. Solomon Z, Zur-Noah S, Horesh D, Zerach g, Keinan G. The contribution of stressful life events throughout the life cycle to combat-induced psychopathology. *J Trauma Stress*. 2008;21:318-325.
223. Stuber J, Resnick H, Galea S. Gender disparities in posttraumatic stress disorder after mass trauma. *Gen Med*. 2006;3:54-67.
224. Taylor S. Social Support. In: Friedman H, Cohen Silver R, eds. *Health Psychology*. New York: Oxford; 2007:145-171.
225. Thavichachart N, Tangwongchai S, Worakul P, Kanchanatawan B, Roomruangwong C, Chareonsook O. Posttraumatic mental health establishment

- of the tsunami survivors in Thailand. *Clinical practice and epidemiology in mental health*; 2009.
226. Thompson MP, Norris FH, Hanacek B. Age differences in the psychological consequences of Hurricane Hugo. *Psychol Aging*. 1993;8:606-616.
 227. Tolin DF, Foa EB. Sex differences in trauma and posttraumatic stress disorder: a quantitative review of 25 years of research. *Psychol Bull*. 2006;132:959-992.
 228. Turner S, Thompson J, Rosser R. The Kings Cross Fire: Psychological Reactions. *J Trauma Stress*. 1995;8:419-427.
 229. van der Kolk BA, McFarlane AC, Weisæth L. *Traumatic Stress: The effects of overwhelming experience on mind, body and society*. New York: Guilford; 1996.
 230. Van der Kolk BA, Weisæth L, Van der Hart O. History of trauma in psychiatry. In: Van der Kolk BA, McFarlane AC, Weisæth L, eds. *Traumatic Stress The effects of overwhelming experience on mind, body and society*. New York London: Guilford; 1996.
 231. van der Ploeg E, Mooren TT, Kleber RJ, van der Velden PG, Brom D. Construct validation of the Dutch version of the impact of event scale. *Psychological assessment*. 2004;16:16-26.
 232. van Griensven F, Chakkraband ML, Thienkrua W, Pengjuntr W, Lopes Cardozo B, Tantipiwatanaskul P, Mock PA, Ekassawin S, Varangrat A, Gotway C, Sabin M, Tappero JW. Mental health problems among adults in tsunami-affected areas in southern Thailand. *JAMA*. 2006;296:537-548.
 233. Vasterling J, Brewin CR. *Neuropsychology of PTSD: Biological, cognitive and clinical perspectives*. New York: Guilford; 2005.
 234. Watson P, Gibson L, Ruzek JI. Public mental health interventions following disasters and mass violence. In: Friedman H, Keane TM, Resick PA, eds. *Handbook of PTSD Science and practice*. New York: Guilford; 2007.
 235. Watson PJ, Shalev AY. Assessment and treatment of adult acute responses to traumatic stress following mass traumatic events. *CNS Spectr*. 2005;10:123-131.
 236. Weidmann A, Fehm L, Fydrich T. Covering the tsunami disaster: Subsequent post-traumatic and depressive symptoms and associated social factors. *Stress and Health: Journal of the International Society for the Investigation of Stress*. 2008;24:pp.
 237. Weisæth L. The European history of psychotraumatology. *J Trauma Stress*. 2002;15:443-452.
 238. Weisæth L. Stress reactions to an industrial disaster. *Division of Disaster Psychiatry, Institute for Psychiatry*. Oslo: University of Oslo; 1984.
 239. Weisæth L. The stressors and post-traumatic stress syndrome after an industrial disaster. *Acta Psychiatr Scand*. 1989;355:25-37.
 240. Weisæth L. A study of behavioural responses to an industrial disaster. *Acta Psychiatr Scand Suppl*. 1989;355:13-24.
 241. Weiss DS. The Impact of event scale - revised. In: Wilson JP, Keane TM, eds. *Assessing psychological trauma and PTSD*. 2nd ed. New York: Guilford; 2004:168-189.
 242. Weiss DS. The Impact of event scale: revised. In: Wilson JP, So-kum Tang C, eds. *Cross-cultural assessment of psychological trauma and PTSD*. New York: Springer; 2007:219-238.
 243. Weiss DS, Marmar CR. The Impact of Event Scale - Revised. In: Wilson JP, Keane TM, eds. *Assessing psychological trauma and PTSD*. New York: The Guilford Press; 1997:399-411.

244. Wessely S. The role of screening in the prevention of psychological disorders arising after major trauma: Pros and cons. In: Ursano RJ, Fullerton CS, Norwood AE, eds. *Terrorism and Disaster*. Cambridge: Cambridge University Press; 2003:121-145.
245. Vetter S, Rossegger A, Rossler W, Bisson JI, Endrass J. Exposure to the tsunami disaster, PTSD symptoms and increased substance use - an Internet based survey of male and female residents of Switzerland. *BMC public health*. 2008;8:92.
246. WHO. Psychosocial consequences of disasters – prevention and management. Geneva: World Health Organisation; 1991.
247. Vieweg B, Hedlund J. The General Health Questionnaire. *Journal of Operat Psychiatry*. 1983;14:74-85.
248. Viinamäki H, Kumpusalo E, Myllykangas M, Salomaa S, Kumpusalo L, Kolmakov S, Ilchenko I, Zhukowsky G, Nissinen A. The Chernobyl accident and mental wellbeing--a population study. *Acta Psychiatr Scand*. 1995;91:396-401.
249. Wills T, Shinar O. Measuring perceived and received social support. In: Cohen S, Underwood L, Gottlieb B, eds. *Social support measurement and intervention*. New York: Oxford University Press; 2000:86-135.
250. Wilson JP, Keane TM, eds. *Assessing Psychological Trauma and PTSD 2nd Ed*. New York: Guilford; 2004.
251. Wilson JP, Raphael B, eds. *International handbook of traumatic stress syndromes*. New York: Plenum Press; 1993.
252. Wu CH, Chen SH, Weng LJ, Wu YC. Social relations and PTSD symptoms: A prospective study on earthquake-impacted adolescents in Taiwan. *J Trauma Stress*. 2009;22:451-459.
253. Vymetal S. Central system of psychosocial support to the Czech victims affected by the Tsunami in Southeast Asia. *Prehospital and disaster medicine*. 2006;21:27-31.
254. Yeager KR, Roberts AR. Differentiating among stress, Acute stress disorder, acute crisis episodes, trauma, and PTSD: Paradigm and treatment goals. In: Roberts AR, ed. *Crisis Intervention Handbook: Assessment, treatment, and research*. Oxford: Oxford University Press; 2005:90-119.
255. Yehuda R, Hyman SE. The impact of terrorism on brain, and behavior: what we know and what we need to know. *Neuropsychopharmacology*. 2005;30:1773-1780.
256. Young BH. The immediate response to disaster: Guidelines for adult psychological first aid. In: Ritchie EC, Watson P, Friedman MJ, eds. *Interventions following mass violence and disasters*. New York: Guilford; 2006.
257. Yule W. Theory, training and timing: psychosocial interventions in complex emergencies. *Int Rev Psychiatry*. 2006;18:259-264.
258. Yzermans CJ, Donker GA, Kerssens JJ, Dirkzwager AJ, Soeteman RJ, ten Veen PM. Health problems of victims before and after disaster: a longitudinal study in general practice. *Int J Epidemiol*. 2005;34:820-826.
259. Zoellner LA, Foa EB, Brigidi BD. Interpersonal friction and PTSD in female victims of sexual and nonsexual assault. *J Trauma Stress*. 1999;12:689-700.
260. http://en.wikipedia.org/wiki/Cyclone_Nargis#Military_junta27s_blockade_of_aid
Retrieved 4th Feb 2010